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SIEMENS

Contact Fault Locator K2007

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Instructions for Operation
S45034-K2007-A102-[illegible],7618

Be sure to Read last Par. page 3-1
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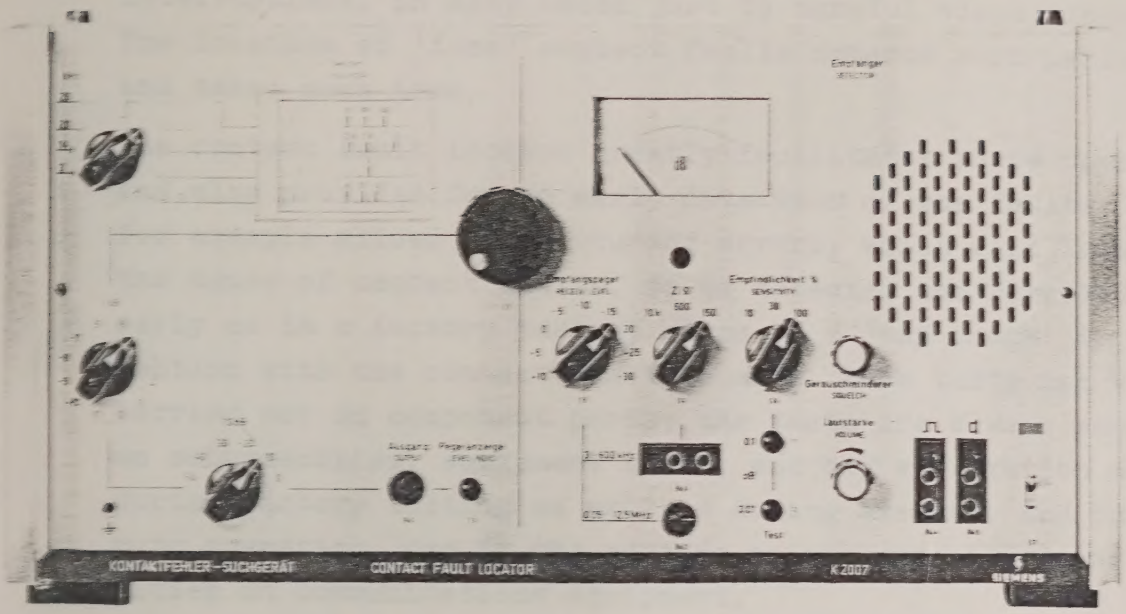
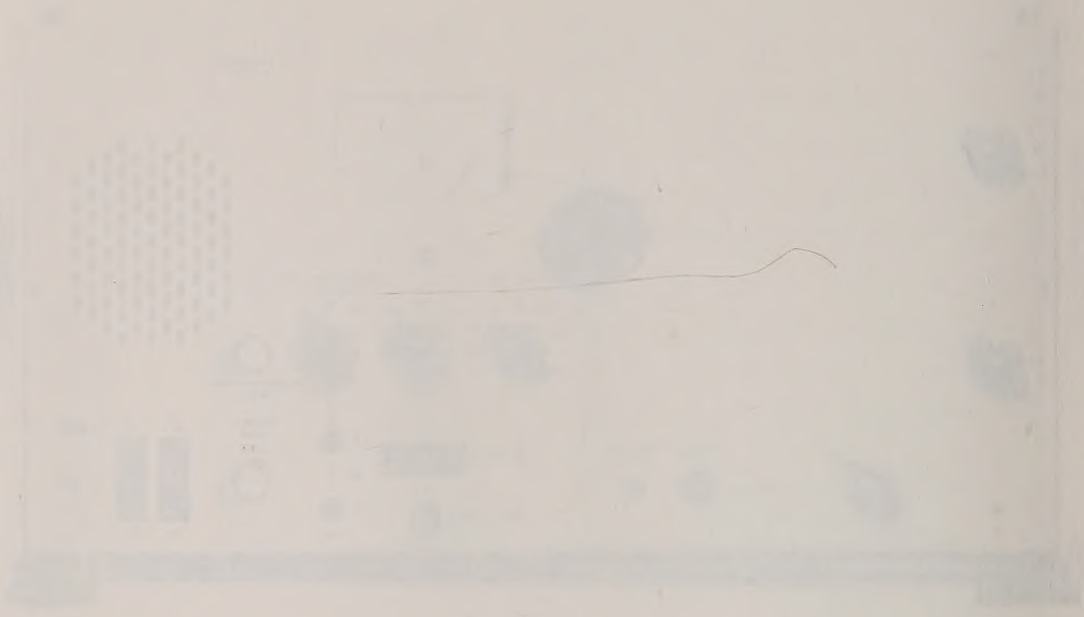


CONTACT FAULT LOCATOR Type K2007

1. APPLICATION

This device is used to detect faults in communications equipment which are due to vibration-sensitive contact points. These faults are caused by e.g. cold joints, wire breaks with intermittent contact closure, and also by short-circuits due to contact with the chassis or other (bare) wires, or by erratic contact points of switches, relays or connectors.

Such faults are often only noticeable after long service, for instance due to corrosion or after particular mechanical stress (vibrations).



It is relatively easy to detect faults due to 'coarse' contact interruptions, in many cases just by careful visual inspection. The location of 'fine' contact faults demands such patience and takes much time.

The contact fault locator greatly facilitates these operations and also provides for an early detection of the faults. This for example allows manufacturing errors, which will later be the cause of contact faults, to be detected and remedied as early as in a factory test by means of a 'tap check' in connection with the contact fault locator. Such tests can even be carried out on component parts; the tests are always advisable on subassemblies, equipment units, and bay and station wiring during factory testing as well as during assembly and putting into operation, and in the routine maintenance or repair activities on communications equipment.

An ac mains of 110 to 240 V supplies the operating voltages via the built-in mains power supply. During field use of the unit along the route, operation from a 12-V battery is also possible via a built-in dc/ac converter.

Technical Data

CONTACT FAULT LOCATOR K 2007

Generator

Frequency Range

fixed frequencies can be switched to . . . 3, 14, 20, 26 kHz

can be set continuously in the bands . . . . . 35 to 100 kHz
100 to 300 kHz
0.3 to 1 MHz
1 to 3 MHz
3 to 10 MHz

Frequency error . . . . . ±10%

Output Level

for zero instrument marker . . . . . 0 to -60 dB

can be set in 5 steps of 10 dB . . . . . 0 to -50 dB

additionally in steps of 1 dB . . . . . 0 to -10 dB

Frequency response of output level as referred to 100 kHz and terminated into 75 Ω . . . . . ±3 dB

Noise modulation of the output voltage (AM) . . . . . $\ll$0.1%

Output

3 kHz to 10 MHz . . . . . coaxial jack 4/13

Source Impedance

in the frequency range of 3 kHz to 1 MHz . . . . . < 10 Ω
to 10MHz . . . . . < 20 Ω

Detector

Frequency Range . . . . . 3 kHz to 12.5 MHz

subdivided in two bands . . . . . 3 kHz to 600 kHz
50 kHz to 12.5 MHz

Input

3 kHz to 600 kHz . . . . . 3-pole jack

50 kHz to 12.5 MHz . . . . . coaxial jack 4/13

Input Impedance

in the frequency range 3 to 600 kHz . . . . >10 kΩ‖approx.50 pF
can be switched to . . . . . 600 and 150 Ω
in the frequency range 50 kHz to 12.5 MHz 75 Ω

Minimum Sudden Level Change

with loudspeaker or earphone
still distinctly perceptible . . . . . 0.01 dB

Sensitivity check

with sudden level change of . . . . . 0.01 and 0.1 dB

Level Measuring Range

for zero instrument mark
can be switched in 8 steps of 5 dB each . . . . -30 to +10 dB
minimum measurable (readable) level . . . . . -35 (-40) dB

Frequency response

of the indication . . . . . ±3 dB

Outputs

Source impedance . . . . . approx. 3.3 kΩ

'Go-/no-go' output

Response sensitivity for 'no-go' statement at
a sudden level change of . . . . . approx. 0.01 dB
Output voltage with 'go' statement . . . . . < 1 V
Output voltage with 'no-go' statement . . . . . ≧ 8 V
Output load R_A . . . . . ≧ 100 kΩ
Pulse length with 'no-go' statement . . . . 500 ±200 ms

Power supply . . . . . 98 to 140 V and 198 to 264 V;
47 to 63 Hz; approx. 12 VA

Battery terminal (dc) . . . . . .11 to 18 V; approx. 0.5 A

Temperature range

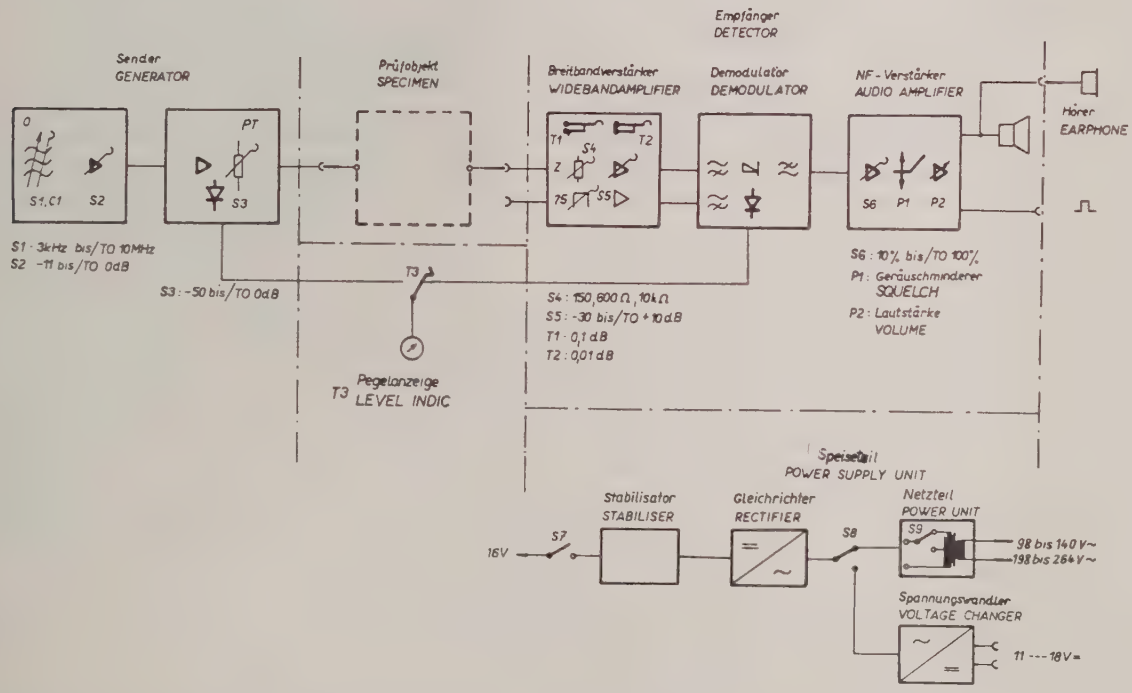
for the specified technical data . . . .+5 °C to + 40 °C

3. FUNCTIONING AND LAYOUT

see basic circuit diagram

A faulty soldering or contact point causes sudden resistance variations during vibrations, e.g. through tapping, which influences the transfer constant of the examined network.

If an ac voltage of constant amplitude is applied to the input of a network, an output voltage fluctuation at the rate of the impedance variation results, i.e. amplitude modulation. The audio voltage obtained by rectification of this amplitude-modulated voltage is audible as a click after amplification in a loudspeaker.

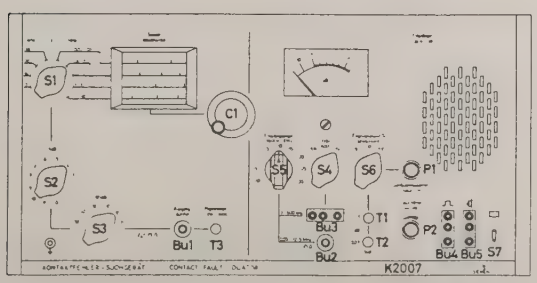


Basic circuit diagram K 2007

The contact fault locator contains a generator section and a detector section. The level oscillator consists of two units, oscillator O and level divider PT. By means of switch S1 one of the first four fixed frequencies (3, 14, 20, 26 kHz) or a frequency in the five tunable bands (35 to 100 kHz, 100 to 300 kHz, 0.3 to 1 MHz, 1 to 3 MHz and 3 to 10 MHz) can be set in the oscillator. Crank knob C1 is used for tuning within the selected band. A buffer amplifier follows the oscillator, which guarantees a constant output level when switching the frequencies and tuning. In the following stage the output level can be switched in steps of 1 dB in a range of 11 dB (S2). The output level of the buffer amplifier is fed to level divider PT (S3) as well as to the rectifier (diodes Gr2 and 3). The output voltage of the rectifier can be connected with button T3 to the indicating instrument, so that the level applied to the specimen under test is checked.

At the other end of the route a second contact fault locator or an external generator can be used instead of the built-in generator for example when measuring lines. The external generator must, however, have very low residual noise (> 60 dB down).

GENERATOR DETECTOR



The specimen connected to the jacks 'output' of the generator should receive the smallest possible ac voltage so that no fritting of faulty contacts results; its frequency must be within the transmission range of the specimen.

During vibration of the specimen, e.g. by tapping with the supplied plastic rod, the ac voltage transferred by the specimen is modulated by vibration-sensitive contacts, i.e. by faulty points.

The output of the specimen is applied to one of the two inputs of the detector.

The first input (shielded 3-pole jack) is intended for the frequency range of 3 to 600 kHz and has an input impedance of >10 kΩ, which can be switched to 600 and 150Ω(S4). The middle (sensitive) input jack is provided with a break contact which normally short-circuits the input.

The coaxial jack represents the second input having an impedance of 75Ω and a frequency range extending from 50 kHz to 12.5 MHz.

Depending on the frequency band of the specimen, its output is connected to the corresponding input.

By means of a series capacitor the amplifier circuits are protected against dc voltages which may be present. In the event of additional dc voltages, it must be noted that the terminations brought into circuit with S4 must not be loaded with more than 0.5 W and the 75-Ω input divider not with more than 100 mW.

The provided terminations are sufficient in most cases; only for specimens of particularly low impedance, e.g. connecting cords or switching contacts, is it advisable to insert a transformer between the specimen and receiving section for matching.

Either input passes via a different channel, consisting of voltage divider, wideband amplifier, high-pass filter and demodulator; they are then united in a common channel.

The input impedances $\geq$ 10 kΩ, 600Ω, 150Ω are set with switch S4 in the channel '3 to 600 kHz'; the voltage divider follows a grounded-emitter stage and is operated with switch S5. (The voltage divider in the other channel is also operated with S5). This is followed by a wideband amplifier for the above frequency range and a high-pass filter, the cutoff frequency of which is approx. 3 kHz. The following transistor operates as a demodulator.

In channel '0.05 to 12.5 MHz' the voltage divider with a constant Z value of 75Ω is included in the line run. This is followed by a wideband amplifier and a high-pass filter, the cutoff frequency of which is approx. 50 kHz, and by another transistor operating as a demodulator.

The high-pass filters are to suppress voltages at frequencies below the transmission range, especially the noise voltages present in the audio range. They would produce interfering noise in the loudspeaker and thus simulate contact faults.

The voltage dividers cover an attenuation range of 40 dB in steps of 5 dB; the input level range for full-scale deflection on the instrument is -30 to +10 dB. From both channels a line is branched off before the demodulator; it goes to the common rectifier of the indicator circuit.

The scale of the taut-suspension meter covers a range of 6 dB. By pressing button T3, the instrument is connected to rectifiers Gr2 and 3 at the buffer amplifier output of the generator in order to set the output level. Otherwise the meter is connected to the output of the two wideband amplifiers for supervision of the carrier voltage present at the demodulator. In conjunction with the level range switch S5, input levels of -35 dB can still be read when switch S5 is in the position -30 dB.

This is the lowest level at which a contact fault location can still be carried out.

The demodulators supply the click voltages caused by contact faults of the specimen. In the low-pass filter the RF components are suppressed (cutoff frequency 1.6 kHz) and the low-frequency voltages are applied to the audio amplifier via a three-position sensitivity switch (S6).

After amplification in the audio amplifier, the click voltage is passed to the squelch circuit, which operates as a minimum-value limiter. Only voltage values above a certain threshold value can pass, which can be set with potentiometer P1. Two diodes (Gr2 and 3) are included in the ac path between capacitors and obtain bias via P1. If the amplitude of the arriving ac voltage is below the dc voltage taken at P1, the rectifiers form a high series-arm resistance. When the peak value of the input ac voltage exceeds the bias, the series-arm resistance and thus also the attenuation of the circuit decreases. It is possible to suppress interfering noise. Now only voltage peaks above the basic noise level will be audible in the loudspeaker. Instead of the loudspeaker an earphone can be used; it can be connected to the jacks 'earphone'; when the earphone plug is inserted, the loudspeaker is disconnected.

The audio gain can be varied with the volume control P2 behind the squelch. In order to obtain a measure for the sensitivity to be set, two well-defined level changes of 0.1 dB (1%) or 0.01 dB (0.1%) can be produced with the aid of button T1 or T2 on the two wideband amplifier inputs; they are independent of the input level and the input frequency. An aural reference measure is so provided. In conjunction with switch S6 (sensitivity) whose three positions are in the ratio 10:30:100, as well as with P2 (volume) and P1 (squelch) the sensitivity can be selected for example in such a manner that with S6 in position '100', the 0.1% change initiated by button T2 can be heard well, but no longer in position '30'; then the 1% change produced with T1 in position '30' can be heard well and in position '10' it can still be heard faintly. Set in this way, sensitivity switching with S6 functions well for discriminating between several faulty contacts in a specimen.

The device is also equipped with a 'go/no-go' output (Bu4). The evaluated noise signal appearing behind the squelch circuit as a consequence of the faulty contact is passed to a monostable flip-flop via an amplifier stage irrespective of the volume setting of the loudspeaker or earphone. When the appearing signal is strong enough, i.e. corresponds to good audibility of a level change of 0.01 dB, the switching state is flipped. This replaces the small voltage $\leqq$ 1 V at jacks Bu 4 (output 'go') with the voltage of $\geqq$ 8 V (statement 'no-go') for the duration of the flipping operation.

The equipment unit can be supplied either by the ac mains or by an external battery, in which case transfer is effected with switch S8 between the power transformer and battery dc/ac converter. The following circuitry of the rectifier and the stabilizer is common for both operating modes. It has been designed in such a manner that the 16-V supply voltage is reached when the mains voltage is between 98 and 140 V or between 198 and 264 V and when the mains voltage adjuster S9 is set to '110 V' and '220 V' respectively or when the battery voltage is between 11 and 18 V.

The dc/ac converter, designed as an additional circuit board, operates at a frequency of 17 to 20 kHz and supplies 20 to 40 V to rectifier Gr1 to 4 (at an input voltage of 11 to 18 V). Switch S8 for selecting the mode of operation (battery mains) is also accommodated on the additional board. In battery operation, the power transformer is not disconnected at the primary, but the battery is disconnected in mains operation.

4. ACCESSORIES, DIMENSIONS AND WEIGHTS

Description	Order No.	Dimensions in mm	Approx. Weight in kg
Contact Fault Locator K 2007			
3 kHz to 10 MHz dB-calibration	S45034-K2007-A102	440x221x197	
Accessories			
Power cord	V45594-F4-A322	2000	0.3
Tapping rod	3XF 446 001	-	-
Optional			
2 coaxial connecting cords 4/13	V42251-C226-D2 to D5	500 to 1500	0.25
1 balanced connecting cord	V42255-R15-A14 to A23	250 to 2000	0.3
1 measuring earphone (2x2500Ω), e.g.Fg tph 60	S30368-Z201-F311	-	-
Inset for the modification of the 4/13 jack to a BNC jack	C44334-A9-A4	61 x 13 dia.	0.03
LEMO jack	C44334-A9-A5	50 x 14 dia.	0.03
1.6/5.6-jack	C44334-A9-A6	59 x 14 dia.	0.03
2.5/6-jack	C44334-A9-A7	52 x 14 dia.	0.03

1. PREPARATION

First check before putting into operation whether the mains voltage corresponds to the voltage set on the instrument. Set the mains voltage adjuster S9 for mains voltages of about 98 and 140 V to position '110 V' and for mains voltages of about 198 and 264 V to position '220 V'.

Normally the unit is delivered set for a mains voltage of 220 V ac.

The current is supplied by a two-wire mains circuit. The unit is designed with protective-grade insulation according to the safety regulations of the Association of German Electrical Engineers. Should another (locally used) plug be necessary instead of the power plug, any assignment of the two wires is permissible.

2. LAYOUT OF THE MEASURING SETUP

The contact fault locator presents a self-contained measuring setup.

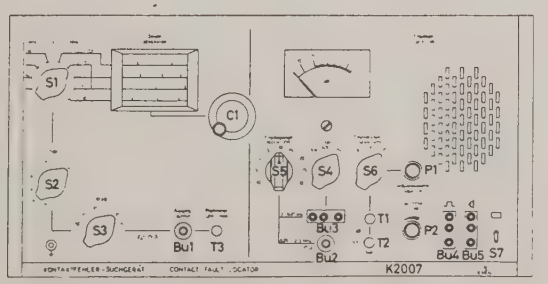
Only in the case of line measurements is a second unit or another signal generator with a corresponding frequency range and small residual noise, e.g. G2021 + W2021 (0.01 to 25 MHz) required at the other end of the route.

The locator can also be operated independently of the mains if an external battery of 11 to 18 V is used. A diode is connected to the input terminal in the unit for protection against wrong polarity.

Before taking any further steps ground the unit.

Connect the specimen between the jacks 'output' and 'input' with shielded cords, e.g. Rel ltg 703d, to h (optional length). When an external generator is used, the jack 'output' on the unit remains free; the specimen is then connected to the output of the external generator.

After closing switch S7 the unit is ready for operation.

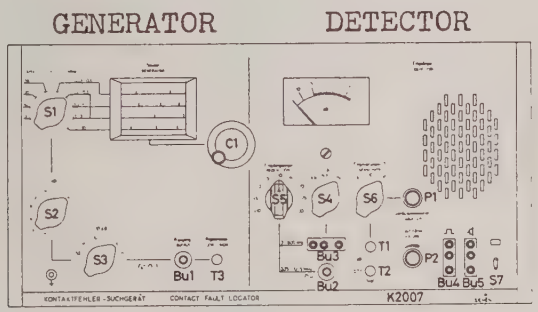


3. MEASURING (CONTACT FAULT LOCATION)

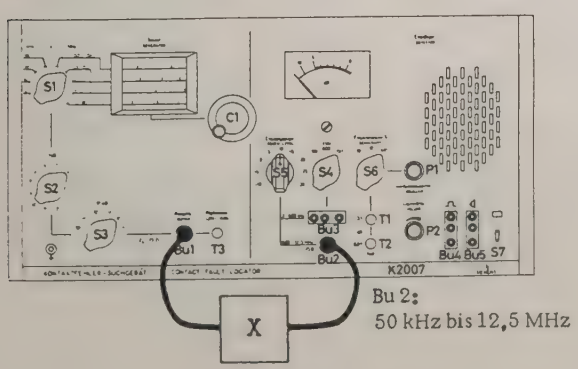
Setting of the Generator

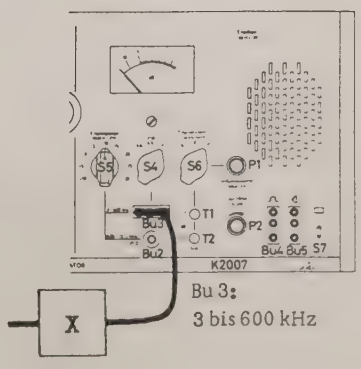
The transmitting frequency which should be in the transmission range of the specimen, is set with switch S1 alone (fixed frequencies) or in combination with crank knob C1 on the frequency scale. The transmitting level is determined by the total of the values read from the setting of switches S2 and S3 and on the meter with button T3 pressed.

Setting of the detector



Depending on the transmission range of the specimen, the coaxial input (Bu2) with an input impedance of 75 Ω in the range of 50 kHz to 12.5 MHz is to be selected, or the shielded 3-pole jack (Bu3) in the range of 3 to 600 kHz. In the latter case, the input impedance, which corresponds to the operating termination of the specimen output, is set by the position of S4 (>10 kΩ in parallel to approx. 50 pF, 600 Ω or 150 Ω). With very low specimen impedance (<<5 Ω) it is advisable to connect an additional matching transformer between the specimen and the detector input.



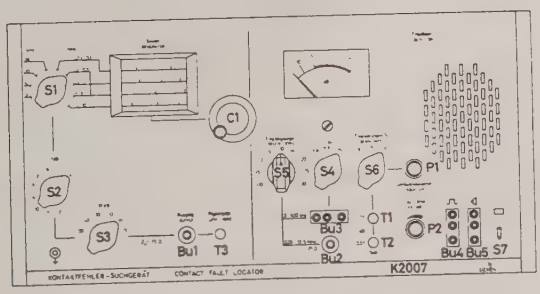


Now the carrier-frequency gain is set with S5 in such a manner that the meter reads between -5 and +1 dB.
If required the transmitting level can be increased with switch S2 or S3.

Potentiometer P2 'volume' is turned fully up and switch S6 is set to '100%'. Set potentiometer P1 'squelch' in a way that the interfering noise (e.g. random noise, hum) just disappears.

Sensitivity Check

Press button T1 or T2 'test'. The sudden level change from 0.1 dB or 0.01 dB should be well audible when switch S6 is set at '30%' and '100%' respectively, but it shall just disappear in the next lower position. If necessary adjust P1 (squelch).



Fault location on the specimen

Even with this instrument, the location of contact fauls demands some practical skill and the procedure must be carried out very carefully. Every circuit or device will have more or less 'tap-sensitive' points which give rise to noise at the output of the fault locator even when no contact fault is present. Such 'apparent faults', which appear as sudden short-time level changes causing clicks, can lead to wrong conclusions, since they mask up the noise of real faults.

Apparent faults are e.g. caused by tube microphonism or mechanical impact on sheet-metal core transformers with a material of high initial permeability. They lead to variations of magnetic characteristics and give rise to the same kind of test signal modulation as a real contact fault. This also holds for capacitors and coils when they are exposed to especially hard impact. The sudden temporary variations of the electrical characteristics can, even when they are very small, lead to transfer constant variations of the specimen, and simulate faults.

In order to be able to distinguish between 'apparent faults' and real contact faults, the examination of the specimen must be carried out logically. This means systematically tapping the specimen with the supplied plastic rod; it is best to begin at the input, following the line runs, and to examine the subassemblies and their wiring up to the output of the device or plug-in.

Decrease the tapping intensity near components sensitive to tapping and if necessary just touch them. Switches can be tested in any detent position by rocking the rotary knob, without moving them on. Tube bases can also be tested for faulty contacts by slightly moving the tube cable. Different click volumes during the tapping procedure of the device give indications as to type and location of the contact fault. To locate or differentiate between several faults, alternately decrease the tapping force and reduce the sensitivity by using switch S6.

4. NOTES ON MAINTENANCE

The device contains silicon transistors as active elements throughout. Some of the elements are firmly screwed to the frame of the device and connected directly via soldering joints. This design has been used taking into consideration the particularly high sensitivity of the device regarding contact faults. Nevertheless the subassemblies are easily accessible for a check and a faulty subassembly can be replaced by loosening a few screws and unsoldering the input and the output leads.

The built-in switches are self-cleaning and require no particular maintenance effort; they should never be treated with greasy or grease-dissolving agents.

Fault Location on the Overall Device K 2007

1. Location on the Deenergized Device

Proceed as follows after removing the upper and the lower cover:

1.1. Examine the power leads to the power supply unit.

1.2. Test the fastening of the circuit boards and switches in the casing.

1.3. Carry out a visual inspection of the wiring system of the device (see annexed Fig. 6).

2. Location on the Energized Device

Note: When connecting the exposed chassis to the mains, attention is to be paid to the safety regulations (e.g. in Germany those of the VDE on electric equipment rooms). These operations should only be carried out by skilled personnel.

The main information for the fault location is given in the circuit diagrams containing voltage data, the wiring diagrams as well as in the following paragraphs.

A voltammeter (Zi = 50 kΩ/V), a sensitive oscilloscope (1 mV/cm) and a wideband oscilloscope (up to 20 MHz) are required for fault location.

2.1. Power Supply Unit (see annexed Fig. 5)

Sequence of the fault location procedure

2.1.1. Mains operation (see annexed Fig. 5)

Switch S8 in position 'MAINS', switch S7 in position 'OFF'

2.1.1.1. Check dc voltage of 16 +0.5/-0.2 V at jack Bu 8/+/ (red) and Bu 9/-/ (black) of section 3 XN 035 021

2.1.1.2. If the voltage according to 2.1.1.1. is incorrect, withdraw power supply unit 3 XN 035 021 and remove the cover

2.1.1.3. Check the ac voltage at contacts 1,2 of the 3 XN 035 020 section

2.1.1.4. If the voltage according to 2.1.1.3. is in order, check the dc voltage of voltage stabilizer 12 XX 069,65-00.

2.1.1.5. If the voltage according to 2.1.1.3. is not in order, check the ac voltage as well as switch S9 of transformer Ü1 (section 3 XN 035 021) and switch S8

Note: The supply voltage 16 V is set by selection of resistor R8, section 3 XN 035 020.

2.1.2. Battery operation (see annexed Fig. 5)
Switch S8 in position 'BATT', switch S7 in position 'OFF', connect the battery (11 to 18 V) to jack Bu 6

2.1.2.1. Perform checks according to 2.1.1.1. and 2.1.1.2.

2.1.2.2. Check the square-wave voltage at contacts 5,6 of section 3 XN 035 019 with an oscilloscope

2.1.2.3. If the voltage according to 2.1.2.2. is in order, check the dc voltages of stabilizer 3 XN 035 020

2.1.2.4. If the voltage according to 2.1.2.2. is incorrect, check the square-wave voltage at collectors T1, T2 of section 3 XN 035 019

2.1.2.5. If the voltage according to 2.1.2.4. is correct, examine Ü1 of section 3 XN 035 019 and S8 of section 3 XN 035 021

2.1.2.6. If the voltage according to 2.1.2.4. is incorrect, examine the rest of the components of dc/ac converter 3 XN 035 019

2.2. Generator (see annexed Fig. 3)
Switches S2 and S3 in position 0 dB, switch S7 in position 0

2.2.1. At connector Bu 1, none of the four fixed frequencies or the frequencies lying in the range of 35 kHz to 10 MHz are present and the meter indicates no deflection when button T3 is pressed

2.2.2. Check the dc voltages of section 3 XN 036 014

2.2.3. With switch S1 in the corresponding position, check the component parts as well as the setting of the operating point of oscillator 3 XN 036 014 according to the following table

Position of Switch S1	Frequency kHz	Tested Component Parts	Setting of the Operat'g Point	Frequency Setting
1.	3	C1.L1.R5,S1	R 5	C 1, L 1
2.	14	C2,L1,R6,S1	R 6	C 2, L 1
3.	20	C3,L1,R7,S1	R 7	C 3, L 1
4.	26	C4,L1,R8,S1	R 8	C 4, L 1
5.	35 to 100	C1tun,L1,R9,S1	R 9	L 1
6.	100 to 300	C1tun,L2,R10,S1	R10	L 2
7.	300 to 1000	C1tun,L3,R11,S1	R11	L 3
8.	1000 to 3000	C1tun,L4,R12,S1	R12	L 4
9.	3000 to 10,000	C1tun,L5,R13,S1	R13	L 5

2.2.4. If there is no signal at jack Bu 1 with switch S1 in any position and if the meter shows no deflection upon pressing of button T3, check the dc voltages of section 3 XN 533 105.

2.2.5. Check the signal at point 3 of section 3 XN 036 014 by means of oscilloscope.

2.2.6. If the signal according to 2.2.5. is correct (level approx. +3 dB), remove the cover of section 3 XN 533 105 (when removing the cover, split open the connection of section 3 XN 036 014 and reestablish it after the removal. Examine the dc voltages of section 3 XN 533 105, as well as the circuit boards of switch S3 and other component parts of section 3 XN 533 105.

2.2.7. If the signal according to 22.5 is incorrect, check the dc voltages of section 3 XN 036 014, switch S2 and other component parts of section 3 XN 036 014 as well as the tuning capacitor C1 and its connection.
Note: Thermistor Th 1 is the most sensitive component part.

2.2.8. If no signal is present at jack Bu 1, but there is an indication on the meter when button T3 is pressed, examine switch S2 with the oscilloscope and point 3 of section 12 XX 069.30-00. Carry out further checks according to 2.2.6.

2.2.9. If the output signal level at Bu 1 does not correspond to the setting of switches S2 and S3, check the signal with the oscillator connected to point 3 of section 3 XN 036 014 when rotating switch S2. The level change must be 1 dB. Optionally the oscilloscope can be connected to jack Bu 1, with switch S3 turned at the same time (after removing the cover of tne voltage divider 3 XN 533 105 according to 2.2.6.). In this case the level variation must be 10 dB.

2.2.10. If a signal is present at jack Bu 1, but no deflection is indicated when R3 is pressed, check the dc voltage between points 5 and 6 of section 3 XN 036 014 (approx. 0.15 V).

2.2.11. If the voltage according to 2.2.10. is correct, examine button T3 as well as the wiring from section 3 XN 036 014 via T3 to the meter (see annexed Fig. 6).

2.2.12. If the voltage according to 2.2.10. is incorrect, examine C15 to C19, C24, Gr 2 and 3, P1, R38, 39 and 41 of section 3 XN 036 014.

2.2.13. If during continuous tuning in the tunable frequency bands a dip effect results (as in the case of the grid-dip meter), check the coils determined for the lower frequency bands, i.e. connection of switches S1/1 and S1/11.

2.3 Detector (see annexed Fig. 4)

Switch S5 in position 0 dB, switch S4 in position 10 kΩ. For the checking, a signal generator with a frequency range from 3 kHz to 12.5 MHz is required which can be modulated with a frequency of 200 to 1500 Hz, and an oscilloscope for up to 20 MHz with a high-impedance probe and a universal voltammeter.

2.3.1. The AM signal (modulation frequency 200 to 1500 Hz, modulation factor approx. 5%) is applied to jack Bu 2 (0.05 to 12.5 MHz) or Bu 3 (3 to 600 kHz) at a frequency in the selected frequency range and at a correct level (switch S5). The meter deflects to the black sector.

2.3.1.1. If no tone is audible at the modulating frequency, turn potentiometers P1 and P2 CW and set switch S6 to the '100%' position. With the oscilloscope connected to contact 1 of section 3 XN 043 030 examine the signal waveform at a modulating signal, which must have the following waveform ∿∿ and not be limited from below.

2.3.1.1.1. If no signal is present according to 2.3.1.1., check the dc voltages at transistor TS 5 and TS 11 respectively of section 3 XN 043 029 as well as the connection between contacts 5, 13 of section 3 XN 043 029 and contact 1 of section 3 XN 043 030.

2.3.1.1.2. If a signal according to 2.3.1.1.1. is present, examine the circuits of potentiometers P1, P2, of switch S6, of loudspeaker Lsp 1, and of the speaker-disconnecting contact.

2.3.1.1.3. If no fault is determined according to 2.3.1.1.2., apply the signal of the generator with 1 kHz and -10 dB to contact 11 of section 3 XN 043 030. If there is no audible sound in the loudspeaker, check the dc voltages of transistors TS 7 to TS 9 as well as C 32, 33 and 41, R 26 to 33.

2.3.1.1.4. If a sound can be heard, apply the signal at 1 kHz and -80 dB to contact 5 of section 3 XN 043 030. If no sound is audible, check the dc voltages of transistors TS 1 to TS 4 as well as C 23 to 31, C 40 and C 43, R 5 to 25 of section XN 043 030.

2.3.1.1.5. If a sound can be heard in the loudspeaker, examine C 1 to 22, L 1 and 4, R 1 of section 3 XN 043 030.

2.3.1.2. If the volume cannot be controlled continuously, check the circuit of P2.

2.3.1.3. If the sensitivity cannot be controlled continuously, check the circuit of P1, the voltages of Gr 2 and Gr 3 as well as C 29 to 31 and R 23 to 25.

2.3.1.4. If the sensitivity step control does not function, examine the circuit of S6.

2.3.1.5. If the loudspeaker is not disconnected when the plug is inserted into the current-carrying jack Bu 5, examine the spring set of the switch.

2.3.1.6. If (when modulating with a unit step pulse of about 0.1 sec. at approx. 10 V) no positive potential is present at jack Bu 4, check the dc voltages of transistors TS 10 to TS 12 as well as C 34 to 38, R 35 to 46 and Gr 1 of section 3 XN 043 030.

2.3.2. The modulated signal (modulation frequency 200 to 1500 Hz, modulation factor approx. 5%) is applied to jack Bu 2 (0.05 to 12.5 MHz) or Bu 3 (3 to 600 kHz) at a frequency in the selected frequency range and with a correct level (switch S5). If the meter does not indicate a deflection but the unit functions, check the dc voltages at contacts 7/+/ and 8/-/ of section 3 XN 043 029. At full-scale deflection the voltage must be 0.12 V.

2.3.2.1. If the voltage according to 2.3.2. is correct, check the wiring between section 3 XN 043 029, button T3 and the indicating meter I 1 as well as Gr1 and C3.

2.3.2.2. If the voltage according to 2.3.2. is incorrect, examine C 16 to 19, C 30 to 32, C 38 to 40, R 25 to 28 and R 61, Gr1 and 2 and P 1 of section 3 XN 043 029.

2.3.3. The modulated signal (modulation frequency 200 to 1500 Hz, modulation factor about 5%) is applied to jack Bu 2 (0.05 to 12.5 MHz) or Bu 3 (3 to 600 kHz) at a frequency lying in the selected frequency range and a correct level (switch S5). The meter shows no deflection and the device operates.

2.3.3.1. Check according to 2.3.1.1.
If the signal according to 2.3.1.1. is correct, a fault is present in the audio section of the detector. In this case proceed according to 2.3.1.1.2. to 2.3.1.1.5., and 2.3.2.1. and 2.3.2.2. respectively.

2.3.3.2. If the signal according to 2.3.3.1. is incorrect, check the dc voltages of section 3 XN 043 029 as well as the sinusoidal signal variation of the transistor emitters TS 4 and TS 10 respectively. If this signal is correct, examine C 8 to 16 and C 30 to 37 respectively, L 1 to 3, R 18 to 25 or R 61 to 68, TS 5 and TS 11 as well as the wiring between contacts 5, 13 of section 3 XN 043 029 and contact 1 of section 3 XN 043 010.

2.3.3.3. If no signal is present at emitter TS 4 and TS 10 respectively, check the sine signal at contacts 14 and 17 respectively of section 3 XN 043 029 with the oscilloscope using a high impedance probe. If a sign signal is present here, examine C 3 to 7, C 21 to 27, R 5 to 17 and R 99, or R 39 to 60 and R 110 and R 101, T1 to 4 and T6 to 10.

2.3.3.4. If no sine signal is present at contact 14 and 17 respectively of section 12 XX 069.20-00, check the signal at contact 18 and 15 respectively of section 3 XN 043 029 with the oscilloscope using a high impedance probe. If a signal is present here, examine dividers R 30 to 38 and R 69 to 96 respectively.

2.3.3.5. If no sine signal is present at contact 18 and 15, respectively, examine the sine signal waveform at the contact of section 3 XN 043 029 and the wiring of the coaxial connector Bu 2 to section 3 XN 054 029 with the oscilloscope using a probe. If no signal is present at contact 1, check jack Bu 3 with the wiring connecting section 3 XN 043 029 as well as the circuit of switch S4. If a signal is present at contact 1, check the dc voltages of transistor T1 as well as

C1 and 2, R 1 to 4 and R 29.

Note: Contact 18 must have a resistance of 1 kΩ against ground.

2.3.4. If the sensitivity control 0.1 and 0.01 dB respectively (buttons T1 and T2) does not operate when the built-in generator is through-connected, which is in operating condition, examine the circuits of T1 and T2 as well as the wiring to section 3 XN 043 029 and R 9 to 11 and C 4.

Note: When an external generator is used, it is very likely that its signal will have a higher noise level so that the operating elements - switch S6 and potentiometer P 1 - must be set in such a manner that this noise is limited. If strong limiting action is required, it may happen that the 0.01-dB change caused by pushing button T2 (preferably several times) is not audible without this being a fault.

		Kf-Kondensator PLASTIC FOIL CAPACITOR	
C1	1	42000pF ±1%; 25 V	TGL 200-8404
C2	1	1970pF ±1%; 63 V	TGL 200-8404
		Kf-Kondensator PLASTIC FOIL CAPACITOR	
C3	1	970pF ±1%; 63 V	TGL 200-8404
C4	1	575pF ±1%; 63 V	TGL 200-8404
		Keramik-Kondensator CERAMIC CAPACITOR	
C7	1	1500 pF +80/-20%; 12,5 V	TK 782
C8,9,10, 12,15,17, 18,19,20	9	0,1/uF +80/-20%; 12,5 V	TK 782
C11,14	2	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 20/uF +100/-20%; 15 V	TE 004
		Keramik-Kondensator CERAMIC CAPACITOR	
C15	1	2,2...15pF ±20%; 500 V Wert wie eingebaut VALUE AS MOUNTED	4TK 322(f.2,2..3,3pF) TK 399(f.4,7..15pF)
C16	1	18...33pF ±20%; 250 V Wert wie eingebaut VALUE AS MOUNTED	4TK 320
C21	1	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 50/uF +100/-20%; 15 V	TE 004
C23	1	Keramik-Kondensator CERAMIC CAPACITOR 3,3 pF ±20%; 500 V	4TK 322
C24	1	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 10/uF +100/-20%; 10 V	TE 003
C25	1	Kondensator CAPACITOR 4700pF ±20%; 350 V	TK 565
C26	1	Keramik-Kondensator CERAMIC CAPACITOR 10...56pF ±20%; 500 V Wert wie eingebaut VALUE AS MOUNTED	4TK 322(f.10..15pF) 4TK 320(f.18..27pF) 4TK 318(f.33..56pF)
		Regelschalter ROTARY SWITCH	
S1	1	1 polig; 5 stöckig; 9 stufig;	3XN 533 108
S2	1	1 polig; 2 stöckig;12 stufig;	3XN 533 107
T1,2, 3,4	4	Silizium-Transistor SILICON TRANSISTOR U_{CEO} = 15 V; I_{CM} = 200 mA Pc = 1 W	KSY 62A (BSY 62)
Th1	1	Heissleiter THERMISTOR R_{20} = 3kOhm 10kOhm	13 NR 01
Gr1	1	Zener-Diode ZENER DIODE U_Z = 5,8...7,5V;I_Z = 5mA	KZZ 71
Gr2,3	2	Germanium-Diode GERMANIUM DIODE I_D = 25 mA; U_{Sp} = 15 V	GA 205

Pegelteiler-Baugruppe 3XN 533 105
LEVEL DIVIDER SUBASSEMBLY

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	390 Ohm ±5%; 0,125 W	TR 112a
R2	1	470 Ohm ±1%; 0,1 W	WK 650 31
R3	1	270 Ohm ±1%; 0,1 W	WK 650 31/d
R4	1	6,8...22kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R5	1	150 Ohm ±5%; 0,125 W	TR 112a
R6	1	1...3,9kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R8,10	2	91 Ohm ±1%; 0,1 W	WK 650 31
R9	1	11 Ohm ±1%; 0,1 W	WK 650 31
R11	1	10 Ohm ±1%; 0,1 W	WK 650 31
R12	1	150 Ohm ±5%; 0,25 W	WK 650 53
C1,2,3, 6,7	5	Keramik-Kondensator CERAMIC CAPACITOR 0,1/uF +80/-20%; 12,5 V	TK 782
		Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR	
C4,8	2	50/uF +100/-20%; 15 V	TE 004
C5	1	100/uF +100/-20%; 10 V	TE 003
		Keramik-Kondensator CERAMIC CAPACITOR	
C9	1	2,2...22pF ±20%; 250 V Wert wie eingebaut VALUE AS MOUNTED	4TK 322
C10	1	1000pF ±20%; 250 V	TK 343
S3	1	Regelschalter ROTARY SWITCH 1 polig; 2 stöckig; 6 stufig;	3XN 533 105
T1,2	2	Silizium-Transistor SILICON TRANSISTOR	KSY 62A (BSY 62)

Breitbandverstärker-Baugruppe 3XN 043 029
WIDE BAND AMPLIFIER SUBASSEMBLY

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,17, 64,99	4	1,2kOhm ±5%; 0,125 W	TR 112a
R2,3	2	68kOhm ±5%; 0,125 W	TR 112a
R4	1	220 Ohm ±5%; 0,125 W	TR 112a
R5	1	8,2kOhm ±5%; 0,125 W	TR 112a
R6	1	82 Ohm ±5%; 0,125 W	TR 112a
R7	1	1,2 Ohm ±5%; 0,25 W	WK 650 53
R8,26,29, 40,43,50, 53,59	8	100 Ohm ±5%; 0,125 W	TR 112a
R9	1	10kOhm ±5%; 0,125 W	TR 112a
R10	1	13...150kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R11	1	15kOhm ±5%; 0,125 W	TR 112a
R12,21,65	3	1kOhm ±5%; 0,125 W	TR 112a
R13	1	330...560 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
R14,41,51	3	3,3kOhm ±5%; 0,125 W	TR 112a
R15	1	120 Ohm ±5%; 0,125 W	TR 112a
R16,47,57, 60,61	5	680 Ohm ±5%; 0,125 W	TR 112a
R18,23,68	3	820 Ohm ±5%; 0,125 W	TR 112a
R19	1	56kOhm ±5%; 0,125 W	TR 112a
R20	1	2,2kOhm ±5%; 0,125 W	TR 112a
R22	1	150 Ohm ±5%; 0,125 W	TR 112a/b
R24,42, 52,66	4	150 Ohm ±5%; 0,125 W	TR 112a
R25,27,44, 46,54,56	6	1,5kOhm ±5%; 0,125 W	TR 112a
R28	1	270 Ohm ±5%; 0,125 W	TR 112a
R30	1	490 Ohm ±1%; 0,05 W	WK 650 30
R31	1	257 Ohm ±1%; 0,05 W	WK 650 30
R32	1	143 Ohm ±1%; 0,05 W	WK 650 30
R33	1	80 Ohm ±1%; 0,05 W	WK 650 30
R34	1	44,10hm ±1%; 0,05 W	WK 650 30
R35	1	24,30hm ±1%; 0,05 W	WK 650 30
R36	1	13,80hm ±1%; 0,05 W	WK 650 30
R37	1	8,2 Ohm ±1%; 0,05 W	WK 650 30/d
R38	1	10 Ohm ±1%; 0,05 W	WK 650 30
R39	1	75 Ohm ±1%; 0,05 W	WK 650 30
R45,55	2	6,8kOhm ±5%; 0,125 W	TR 112a
R48	1	270...280 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R49	1	330 Ohm ±5%; 0,125 W	TR 112a
R58	1	270...750 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R62,67	2	56 Ohm ±5%; 0,125 W	TR 112a
R63	1	33kOhm ±5%; 0,125 W	TR 112a
R69,92	2	267,70hm ±1%; 0,1 W	WK 650 31
R70,91	2	144,40hm ±1%; 0,1 W	WK 650 31
R71,90,95	3	107,70hm ±1%; 0,1 W	WK 650 31
R72,89,96	3	91,70hm ±1%; 0,1 W	WK 650 31
R73,88	2	85,90hm ±1%; 0,1 W	WK 650 31
R74,87	2	79,90hm ±1%; 0,1 W	WK 650 31
R75,76	2	91,70hm ±1%; 0,25 W	TR 106
R77	1	45,60hm ±1%; 0,1 W	WK 650 31
R78	1	106,70hm ±1%; 0,1 W	WK 650 31
R79,93	2	201,50hm ±1%; 0,1 W	WK 650 31

		Schichtwiderstand LAYER-TYPE RESISTOR	
R80,83, 94,94	4	371,5Ohm ±1%; 0,1 W	WK 650 31
R81	1	671 Ohm ±1%; 0,25 W	TR 161
R82	1	1,18kOhm ±1%; 0,25 W	TR 161
R85	1	45,8 Ohm ±1%; 0,1 W	WK 650 31
R86	1	49,5 Ohm ±1%; 0,1 W	WK 650 31
R100	1	13 Ohm ±2%; 0,05 W	WK 650 30
R101	1	56...150 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
P1	1	Schicht-Drehwiderstand LAYER-TYPE VAR RESISTOR 2,2kOhm ±30%; 0,3 W	TP 110
		Schalenkernspule POT-CORE COIL	
L1	1	Wicklg. (5, 1) 530 Wdg; 0,18 CuT 44,1 mH ±1%	3XE 195 041 Kern J18/11 H22 A_L = 400
L2	1	Wicklg. (4, 8) 354 Wdg; 0,18 CuU 50,6 mH ±1%	3XE 195 042 Kern J18/11 H22 A_L = 400
L3	1	Wicklg. (4, 8) 136 Wdg; 0,25 CuU 1,29 mH ±1%	3XE 195 043 Kern J18/11 N08P A_L = 100
C1	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 22000pF ±20%; 400 V	TC 276
C2,3,22, 34	4	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 50/uF +100/-20%; 15 V	TE 004
		Keramik-Kondensator CERAMIC CAPACITOR	
C4,6,16, 17,18,21, 26,29,33 36,37	11	0,1/uF +80/-20%; 12,5 V	TK 782
C5	1	4,7pF ±20%; 500 V	TK 656
C7,14,44	3	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 10/uF +100/-20%; 10 V	TE 003
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C8	1	33700pF ±1%; 25 V	TGL 200-8404
C9	1	5100pF ±1%; 63 V	TGL 200-8404
C10	1	45700pF ±1%; 25 V	TGL 200-8404
C11	1	3500pF ±1%; 63 V	TGL 200-8404
C12	1	36300pF ±1%; 25 V	TGL 200-8404
C13	1	29800pF ±1%; 25 V	TGL 200-8404
C15,35	2	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 100/uF +100/-20%; 25 V	TC 974
C19,24, 25,28	4	Keramik-Kondensator CERAMIC CAPACITOR 15000pF +80/-20%; 12,5 V	TK 782
C20	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 10000pF ±20%; 400 V	TC 276
C23,27	2	Keramik-Kondensator CERAMIC CAPACITOR 3,3pF ±20%; 350 V	TK 650
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C30	1	146pF ±1%; 63 V	TGL 200-8404
C31,32	2	4450pF ±1%; 63 V	TGL 200-8404
C38	1	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 50/uF +100/-20%; 6 V	TE 002
C39,40	2	Keramik-Kondensator CERAMIC CAPACITOR 2,2..15pF ±20%; 500 V Wert wie eingebaut VALUE AS MOUNTED	4TK 322(f.2,2..4,7pF) TK 309(f.6,8..15pF)
C42	1	Keramik-Kondensator CERAMIC CAPACITOR 33pF ±20%; 250 V	TK 308
C43	1	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 200/uF +100/-20%; 6 V	TE 002
C45	1	Keramik-Kondensator CERAMIC CAPACITOR 22...100pF ±20%; 250 V Wert wie eingebaut VALUE AS MOUNTED	4TK 408
S5	1	Regelschalter ROTARY SWITCH 1 polig; 4 stöckig; 9 stufig;	3XN 533 106
		NPN-Silizium-Transistor NPN SILICON TRANSISTOR	
T1,2, 3,4	4	U_{CEO} = 20 V; I_{CM} = 200mA; Pc = 300 mW	KC 508 (BCY 58)
T5,11	2	U_{CEO} = 45 V; I_{CM} = 200 mA; Pc = 300 mW	KC 507 (BCY 58)
T6,7,8, 9,10	5	U_{CEO} = 15 V; I_{CM} = 200 mA; Pc = 1 W	KSY 62A (BSY 62)
Gr1,2	2	Germanium-Diode GERMANIUM DIODE I_D = 25mA; U_{Sp} = 15 V	GA 205
		Silizium-Diode SILICON DIODE	
Gr3	1	I_D = 50mA; U_{Sp} = 115 V	KA 502
Gr4,5,6	3	I_D = 50mA; U_{Sp} = 75 V	KAY 20

NF-Verstärker-Baugruppe 3XN 043 030
AUDIO AMPLIFIER SUBASSEMBLY

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,8,44	3	100 Ohm ±5%; 0,125 W	TR 112a
R5	1	8,2kOhm ±5%; 0,125 W	TR 112a
R6,15,17, 36,40,45	6	10kOhm ±5%; 0,125 W	TR 112a
R7	1	82kOhm ±5%; 0,125 W	TR 112a
R9	1	27kOhm ±5%; 0,125 W	TR 112a
R10,19	2	1,5kOhm ±5%; 0,125 W	TR 112a
R11	1	680 Ohm ±5%; 0,125 W	TR 112a
R12	1	22...430 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R13,37	2	3,3kOhm ±5%; 0,125 W	TR 112a
R14,25,26	3	270 Ohm ±5%; 0,125 W	TR 112a
R16	1	18kOhm ±5%; 0,125 W	TR 112a
R18,27	2	56 Ohm ±5%; 0,125 W	TR 112a
R20	1	390 Ohm ±5%; 0,125 W	TR 112a
R21	1	120...500 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
R22,23	2	220 Ohm ±5%; 0,125 W	TR 112a
R24	1	2,2kOhm ±5%; 0,125 W	TR 112a
R28	1	22 Ohm ±5%; 0,125 W	TR 112a
R29	1	22...82kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R30,31	2	1 Ohm ±10%; 0,25 W	WK 650 53
R32	1	330 Ohm ±5%; 0,25 W	WK 650 53
R33	1	1kOhm ±5%; 0,125 W	TR 112a
R35	1	39...100kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R38	1	560 Ohm ±5%; 0,125 W	TR 112a
R39	1	10...47kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
R41,43	2	5,6kOhm ±5%; 0,125 W	TR 112a
R42	1	0,22MOhm ±5%; 0,125 W	TR 112a
R46	1	47kOhm ±5%; 0,125 W	TR 112a
R47	1	22 Ohm ±5%; 0,125 W	TR 112a
		Schalenkernspule POT-CORE COIL	
L1	1	Wicklg. (4, 8) 560 Wdg 0,125 W CuU 126,3 mH ±1%	3XE 195 037 Kern J18/11 H22 A_L = 400
L2	1	Wicklg. (4, 8) 535 Wdg 0,125 W CuU 118,5 mH ± 1%	3XE 195 038 Kern J18/11 H22 A_L = 400
L3	1	Wicklg. (4, 8) 520 Wdg 0,125 W CuU 112,5 mH ± 1%	3XE 195 039 Kern J18/11 H22 A_L = 400
L4	1	Wicklg. (4, 8) 550 wdg 0,125 W CuU 116,5 mH ± 1%	3XE 195 040 Kern J18/11 H22 A_L = 400

Symbol SYMBOL	Stck. QTY	Gegenstand DESCRIPTION	Bestellangabe ORDERING DATA	Seite PAGE
	1	Oszillator-Baugruppe OSCILLATOR SUBASSEMBLY	3XN 036 014	5-1
	1	Pegelteiler-Baugruppe LEVEL DIVIDER SUBASSEMBLY	3XN 533 105	5-2
	1	Breitbandverstärker-Baugruppe WIDE BAND AMPLIFIER SUBASSEMBLY	3XN 043 029	5-2
	1	NF-Verstärker-Baugruppe AUDIO AMPLIFIER SUBASSEMBLY	3XN 043 030	5-3
	1	Speiseteil-Baugruppe POWER SUPPLY SUBASSEMBLY	3XN 035 021	5-4
	1	Stabilisator-Baugruppe STABILIZED POWER SUPPLY SUBASSEMBLY	3XN 035 020	5-4
	1	Spannungswandler-Baugruppe VOLTAGE CHANGER SUBASSEMBLY	3XN 035 019	5-4
		Schichtwiderstand LAYER-TYPE RESISTOR		
R1,4	2	470 Ohm ±5%; 0,125 W	TR 112a	
R2	1	150 Ohm ±5%; 0,125 W	TR 112a	
R3	1	68 Ohm ±5%; 0,125 W	TR 112a	
R5	1	22 Ohm ±5%; 0,5 W	TR 144	
R6	1	3,3kOhm ±5%; 0,125 W	TR 112a	
		Schichtwiderstamd LAYER-TYPE RESISTOR		
R7	1	620 Ohm ±1%; 0,5 W	TR 107	
R8	1	150 Ohm ±1%; 0,5 W	TR 107	
R9	1	470 Ohm ±2%; 0,05W	WK 650 30	
R10	1	56 Ohm ±2%; 0,05W	WK 650 30	
R11	1	12 Ohm ±2%; 0,05W	WK 650 30	
R12	1	220 Ohm ±2%; 0,05W	WK 650 30	
		Schicht-Drehwiderstand LAYER-TYPE VAR RESISTOR		
P1	1	1kOhm ±30%; 0,5W lin		
P2	1	2kOhm ±30%; 0,5W log		
		Kondensator CAPACITOR		
C1	1	15...500pF; 250 V Wert wie eingebaut VALUE AS MOUNTED	3XN 70525	
C2,6,7,8, 9,10	6	22000pF +80%/-20%;100V	TK 440	
C3	1	0,1 µF +80%/-20%;12,5V	TK 782	
C4	1	18...120pF ±20%; 250V Wert wie eingebaut VALUE AS MOUNTED	4TK 320	
C5	1	100 µF +100%/-10%; 25V	TC 974	
		Regelschalter ROTARY SWITCH		
S4	1	1 polig; 1 stöckig; 5 stufig	CN 004 193	
S6	1	1 polig; 1 stöckig; 3 stufig	CN 004 193	
S7	1	Netzschalter POWER SWITCH	CN 004 125	
		Taste KEY		
T1,2	2		4FK 460 004	
T3	1		3FK 46105.05	
Lsp1	1	Lautsprecher LOUDSPEAKER Z = 16 Ohm; p = 1W	ARZ 388	
Gr1	1	Silizium-Diode SILICON DIODE I_D = 50mA; U_{Sp}=115 V	KA 502	
J	1	DH-Instrument DH INSTRUMENT 150 µA ±2,5%; 80 Ohm ±5%	MP 80	

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	100kOhm ±5%; 0,125 W	TR 112a
R2	1	15kOhm ±5%; 0,125 W	TR 112a
R3	1	390...820 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
R5	1	1...7,7kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R6,7	2	3,3...8,2kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R8,9,10	3	3,3....16kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
		Schichtwiderstand LAYER-TYPE RESISTOR	
R11	1	3,3....15kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R12	1	560 Ohm..3,3kOhm ±5%;0,125W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
R13	1	0,1....1kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
R14,39	2	1,5kOhm ±5%; 0,125 W	TR 112a
R16,18	2	10kOhm ±5%; 0,125 W	TR 112a
R17	1	220kOhm ±5%; 0,125 W	TR 112a
R19	1	2,7kOhm ±5%; 0,125 W	TR 112a
R20	1	330 Ohm ±5%; 0,125 W	TR 112a
R21	1	1kOhm ±5%; 0,125 W	TR 112a
R22	1	270 Ohm ±5%; 0,125 W	TR 112a
R23	1	100...510 Ohm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R24	1	560 Ohm ±5%; 0,125 W	TR 112a
R25	1	100...680 Ohm ±0,5%;0,125W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/b
R26	1	88,43 Ohm ±1%; 0,05 W	WK 650 30
R27	1	78,82 Ohm ±1%; 0,05 W	WK 650 30
R28	1	77,25 Ohm ±1%; 0,05 W	WK 650 30
R29	1	62,48 Ohm ±1%; 0,05 W	WK 650 30
R30	1	55,93 Ohm ±1%; 0,05 W	WK 650 30
R31	1	49,73 Ohm ±1%; 0,05 W	WK 650 30
R32	1	44,32 Ohm ±1%; 0,05 W	WK 650 30
R33	1	39,50 Ohm ±1%; 0,05 W	WK 650 30
R34	1	35,21 Ohm ±1%; 0,05 W	WK 650 30
R35	1	31,38 Ohm ±1%; 0,05 W	WK 650 30
R36	1	27,96 Ohm ±1%; 0,05 W	WK 650 30
R37	1	229,2 Ohm ±1%; 0,05 W	WK 650 30
R38	1	150 Ohm ±5%; 0,125 W	TR 112a
		Schichtwiderstand LAYER-TYPE RESISTOR	
R40	1	120 Ohm ±5%; 0,125 W	TR 112a
R41	1	12kOhm ±5%; 0,125 W	TR 112a
R42	1	470 Ohm..2,2kOhm ±5%;0,125W Wert wie eingebaut VALUE AS MOUNTED	TR 112a/a
P1	1	Schicht-Drehwiderstand LAYER-TYPE VAR RESISTOR 22kOhm ±30%; 0,5 W	TP 110
		Schalenkernspule POT-CORE COIL	
L1	1	Wicklg.(8, 1, 5) 380 Wdg 0,1 CuT2H 62 mH ±5% Abgriff (1): 230 Wdg	3XE 195 044 Kern J18/11 H2 A_L = 400
L2	1	Wicklg.(8, 1, 5) 155 Wdg 0,19 CuT2H 6,2 mH ±5% Abgriff (1): 75 Wdg	3XE 195 045 Kern J18/11 H1 A_L = 250
L3	1	Wicklg.(2, 4, 8) 46 Wdg 0,3 CuT2H 600 µH ±5% Abgriff (4): 28 Wdg	3XE 195 046 Kern J18/11 H1 A_L = 250
L4	1	Wicklg.(5, 2, 8) 24 Wdg 0,3 CuT2H 60 µH ±5% Abgriff (2): 12 Wdg	3XE 195 047 Kern J18/11 H6 A_L = 100
L5	1	Wicklg.(5, 2, 8) 10 Wdg 0,3 CuTPa 6 µH ±5% Abgriff (2): 5 Wdg	3XE 195 048 Kern J18/11 N08 A_L = 63

		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C1,2,5, 6,7,9, 10,11,13, 14,15,16, 17	13	56000pF ±1%; 25 V	TGL 200-8404
C3	1	28500pF ±1%; 25 V	TGL 200-8404
C4	1	42300pF ±1%; 25 V	TGL 200-8404
C8	1	25300pF ±1%; 25 V	TGL 200-8404
C12	1	26600pF ±1%; 25 V	TGL 200-8404
C18	1	19300pF ±1%; 25 V	TGL 200-8404
C19	1	5500pF ±1%; 63 V	TGL 200-8404
C20	1	22600pF ±1%; 25 V	TGL 200-8404
C21	1	28700pF ±1%; 25 V	TGL 200-8404
C22	1	13300pF ±1%; 25 V	TGL 200-8404
C23,26,34	3	Keramik-Kondensator CERAMIC CAPACITOR 0,1/uF +80/-20%; 12,5 V	TK 782
		Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR	
C24,27	2	50/uF +100/-20%; 6 V	TE 002
C25	1	100/uF +100/-20%; 10 V	TE 003
C28,33, 37,41,43	5	50/uF +100/-20%; 15 V	TE 004
C29,30, 31,32	4	2/uF +100/-20%; 35 V	TE 005
C35	1	Keramik-Kondensator CERAMIC CAPACITOR 15000pF +80/-20%; 12,5 V	TK 782
C36	1	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 10/uF +100/-20%; 35 V	TE 005
C40	1	Keramik-Kondensator CERAMIC CAPACITOR 4700pF +80/-20%; 12,5 V	TK 751
C42	1	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 1000/uF +100/-20%; 15 V	TR 984
		NPN-Silizium-Transistor NPN SILICON TRANSISTOR	
T1	1	U_{CEO} = 20 V; I_{CM} = 200 mA; Pc = 300 mW	KC 509 (BCY 58)
T2,3,4	3	U_{CEO} = 20 V; I_{CM} = 200 mA; Pc = 300 mW	KC 508 (BCY 58)
T7,8	2	NPN-Silizium-Transistor NPN SILICON TRANSISTOR U_{CEO} = 30 V; I_{CM} = 500 mA Pc = 0,8 W	KFY 34 (BFY 34)
T9	1	PNP-Silizium-Transistor PNP SILICON TRANSISTOR U_{CEO} = 45 V; I_{CM} = 600 ma Pc = 0,8 W	KFY 16
T10,11,12	3	NPN-Silizium-Transistor NPN SILICON TRANSISTOR U_{CEO} = 20 V; I_{CM} = 200 mA Pc = 300 mW	KC 508 (BCY 58)
Gr1,2,3	3	Silizium-Diode SILICON DIODE I_D = 50 mA; U_{Sp} = 115 V	KA 502

Speiseteil-Baugruppe 3XN 035 021
POWER SUPPLY SUBASSEMBLY

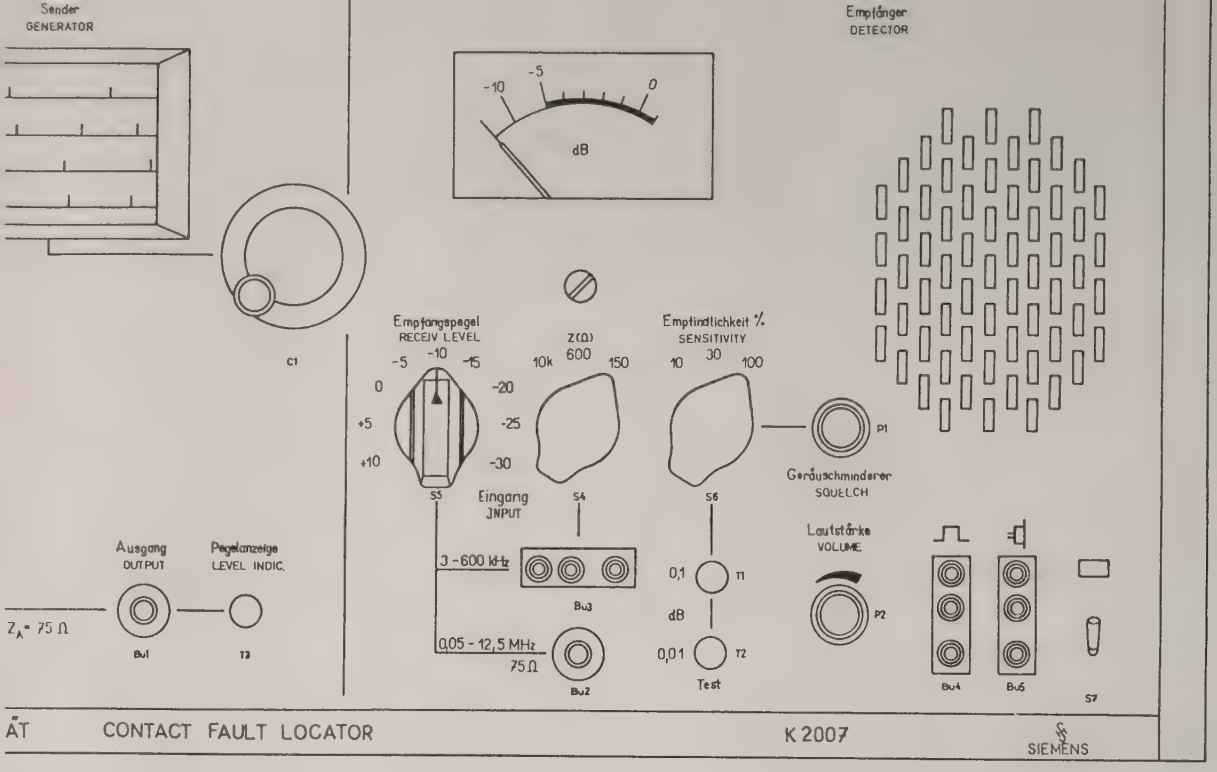
Ü1	1	Netztransformator POWER TRANSFORMER Wicklg. I 2300 Wdg 0,17 CuU Wicklg. II (8,9,7) 600 Wdg 0,355 CuU Abgriff (9): 270 Wdg	3XE 375 024
C1	1	Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR 500/uF +100/-10%; 150 V	TC 939
S8	1	Schalter SWITCH	CN 004 125
S9	1	Spannungswahlschalter VOLTAGE SELECTOR (110 - 220 V)	1AM 517 004

Stabilisator-Baugruppe 3XN 035 020
STABILIZED POWER SUPPLY SUBASSEMBLY

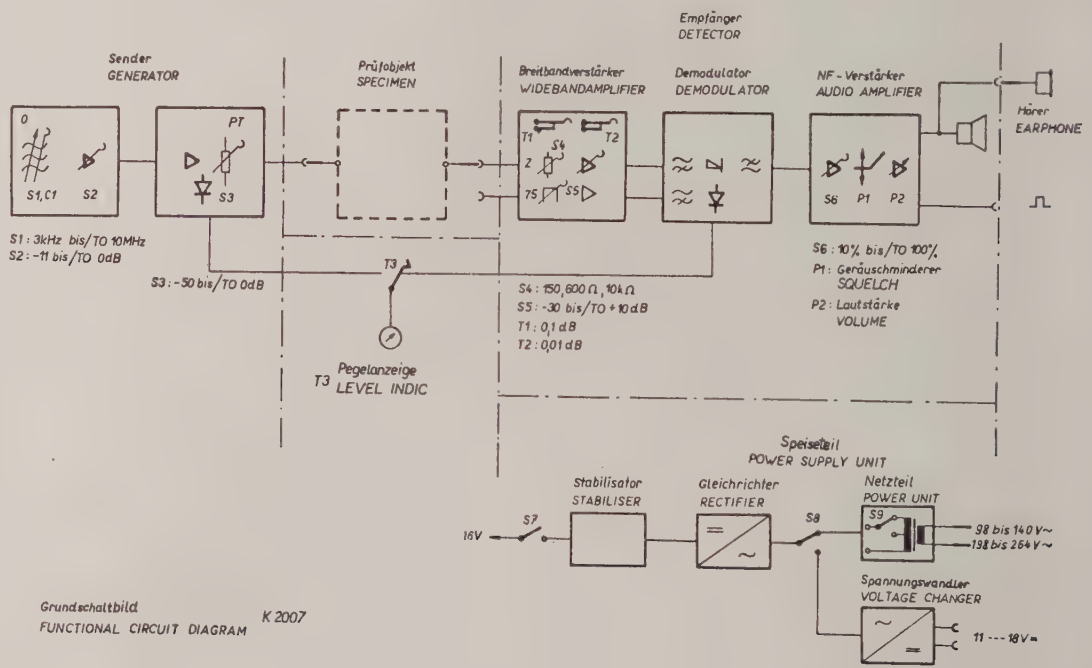
		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	10kOhm ±10%; 1 W	TR 153
R2	1	470 Ohm ± 5%; 0,125 W	TR 112a
R3	1	1,5kOhm ± 5%; 0,125 W	TR 112a
R4,5	2	2,2 Ohm ±10%; 1 W	TR 635
R6	1	3,3kOhm ± 5%; 0,125 W	TR 112a
R7	1	4,7 Ohm ± 5%; 0,125 W	TR 112a
R8	1	10...100kOhm ±5%; 0,125 W Wert wie eingebaut VALUE AS MOUNTED	TR 112a
		Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR	
C1,2	2	20/uF +100/-20%; 150 V	TC 977
C3,4,5	3	100/uF +100/-20%; 25 V	TC 974
C6	1	Kondensator CAPACITOR 68/uF +80/-20%; 12,5 V	TK 782
		Silizium-Transistor SILICON TRANSISTOR	
T1	1	U_{CEO} = 100 V; I_{CM} = 15 A Pc = 115 W	2N 3055 (BDY 39)
T2	1	U_{CEO} = 100 V; I_{CM} = 50 mA Pc = 0,7 W	KF 504
T3	1	U_{CEO} = 20 V; I_{CM} = 0,2 A Pc = 0,3 W	KC 509 (BCY 58)
		Silizium-Diode SILICON DIODE	
Gr1,2, 3,4	4	I_D = 1A; U_{Sp} = 400 V	KY 704F
Gr5,6,7, 8,10	5	I_D = 350 mA; U_{Sp} = 50 V	KA 502
Gr9	1	Zener-Diode ZENER DIODE I_Z = 5 mA; U_Z = 7,0...9,4 V	KZZ 72

Spannungswandler-Baugruppe 3XN 035 019
VOLTAGE CHANGER SUBASSEMBLY

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,2	2	10 Ohm ± 5%; 0,125 W	TR 112a
R3	1	470 Ohm ± 5%; 1 W	TR 635
R4	1	252 Ohm ±10%; 1 W	TR 635
R5	1	68...470 Ohm ±10%; 0,5 W Wert wie eingebaut VALUE AS MOUNTED	TR 144/a
Ü	1	Übertrager TRANSFORMER Wicklg. I (2) 34 Wdg 0,45 CuU Wicklg. II (2,3) 34 Wdg 0,45 CuU Wicklg. III (6,7) 4 Wdg 0,16 CuU Wicklg. IV (7,8) 4 Wdg 0,16 CuU Wicklg. V (4,5) 75 Wdg 0,30 CuU	3XE 192 036
		Elektrolyt-Kondensator ELECTROLYTIC CAPACITOR	
C1,2	2	68000pF ±20%; 400 V	TC 276
C3,4	2	100/uF +100/-20%; 25 V	TC 974
T1,2	2	Silizium-Transistor SILICON TRANSFORMER U_{CEO} = 100 V; I_{CM} = 15 A; Pc = 115 W	2N 3055 (BDY 39)
Gr1	1	Silizium-Diode SILICON DIODE I_D = 0,7 A; U_{Sp} = 80 V	KY 701

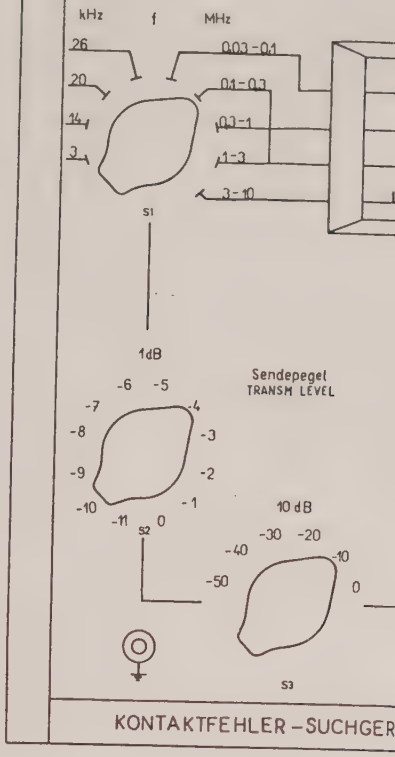


Bildanlage 1
ANNEXED FIG. 1



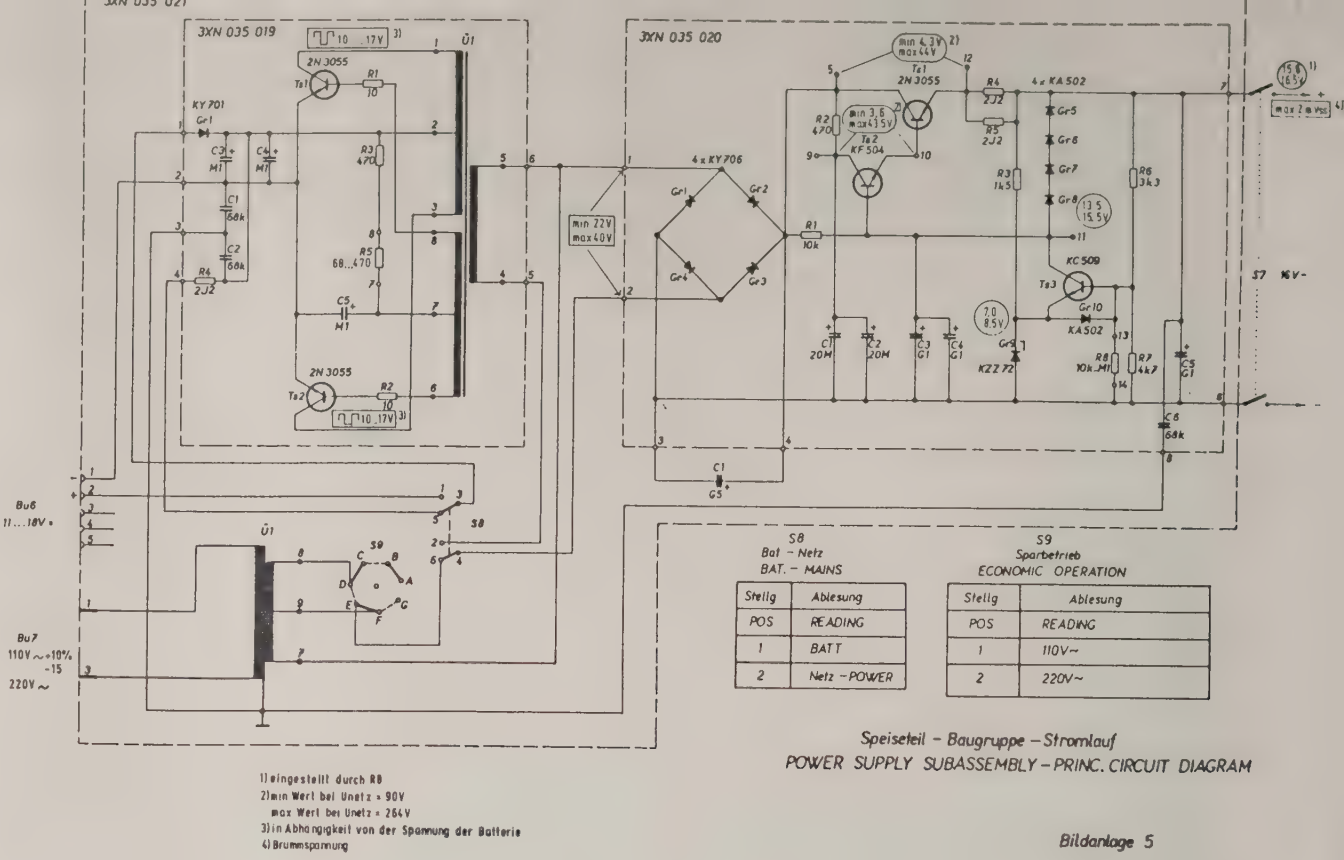
Grundschaltbild
FUNCTIONAL CIRCUIT DIAGRAM
K 2007

Bildanlage 2
ANNEXED FIG. 2



Frontansicht

PANEL VIEW



S8
Bat – Netz
BAT. – MAINS

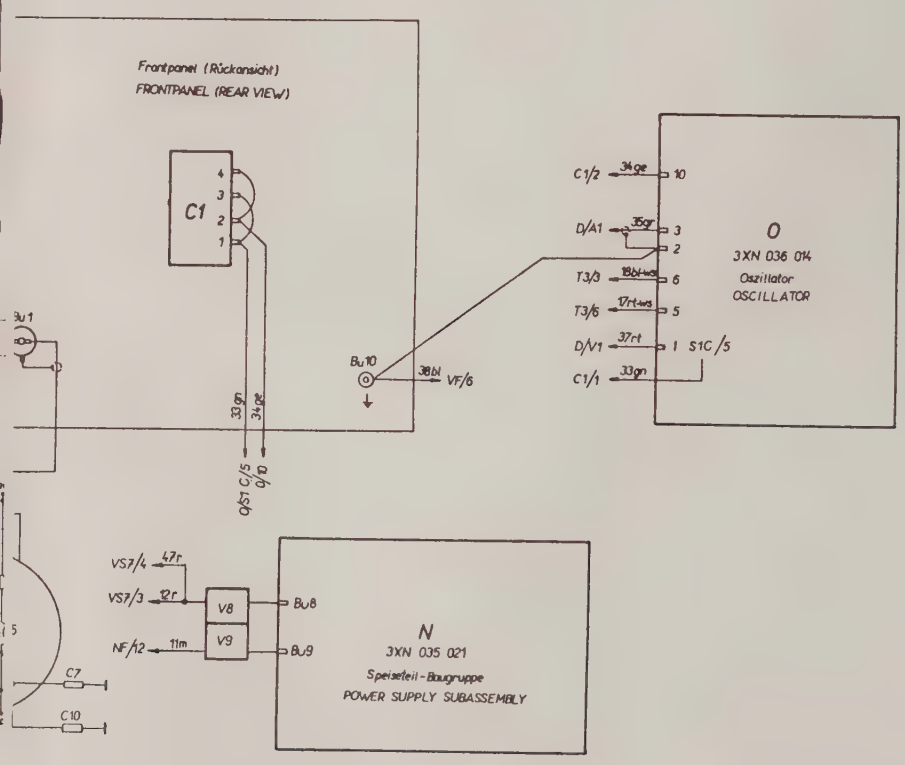
Stellg	Ablesung
POS	READING
1	BATT
2	Netz – POWER

S9
Sparbetrieb
ECONOMIC OPERATION

Stellg	Ablesung
POS	READING
1	110V~
2	220V~

Speiseteil – Baugruppe – Stromlauf
POWER SUPPLY SUBASSEMBLY – PRINC. CIRCUIT DIAGRAM

Bildanlage 5
ANNEXED FIG. 5



Kontaktfehlersuchgerät K 2007
Montageschaltbild
CONTACT FAULT LOCATOR K 2007
MOUNTING DIAGRAM

Bildanlage 6
ANNEXED FIG. 6

VF
3XN 043 029
Breitbandverstärker
WIDE BAND AMPLIFIER
NF
3XN 043 030
NF Verstärker
LF AMPLIFIER
Bezeichnung der Buchse Bu3 ..... Bu5
SIGN OF THE TERMINAL Bu3 ..... Bu5
Rückansicht
REAR VIEW
D
3XN 533 1
Teiler
DIVIDER

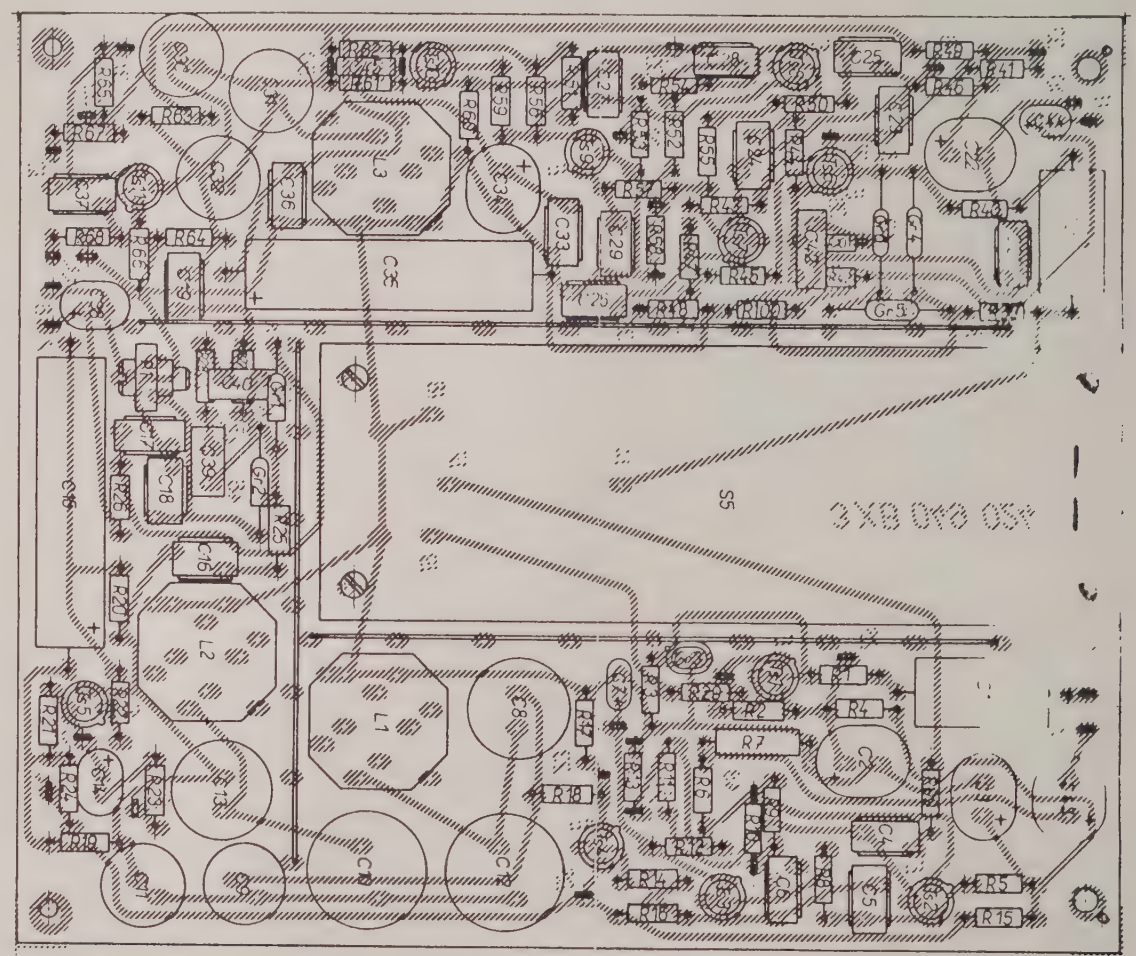


Bild 9 Breitbandverstärker-Baugruppe

FIG. 9 WIDE BAND AMPLIFIER SUBASSEMBLY

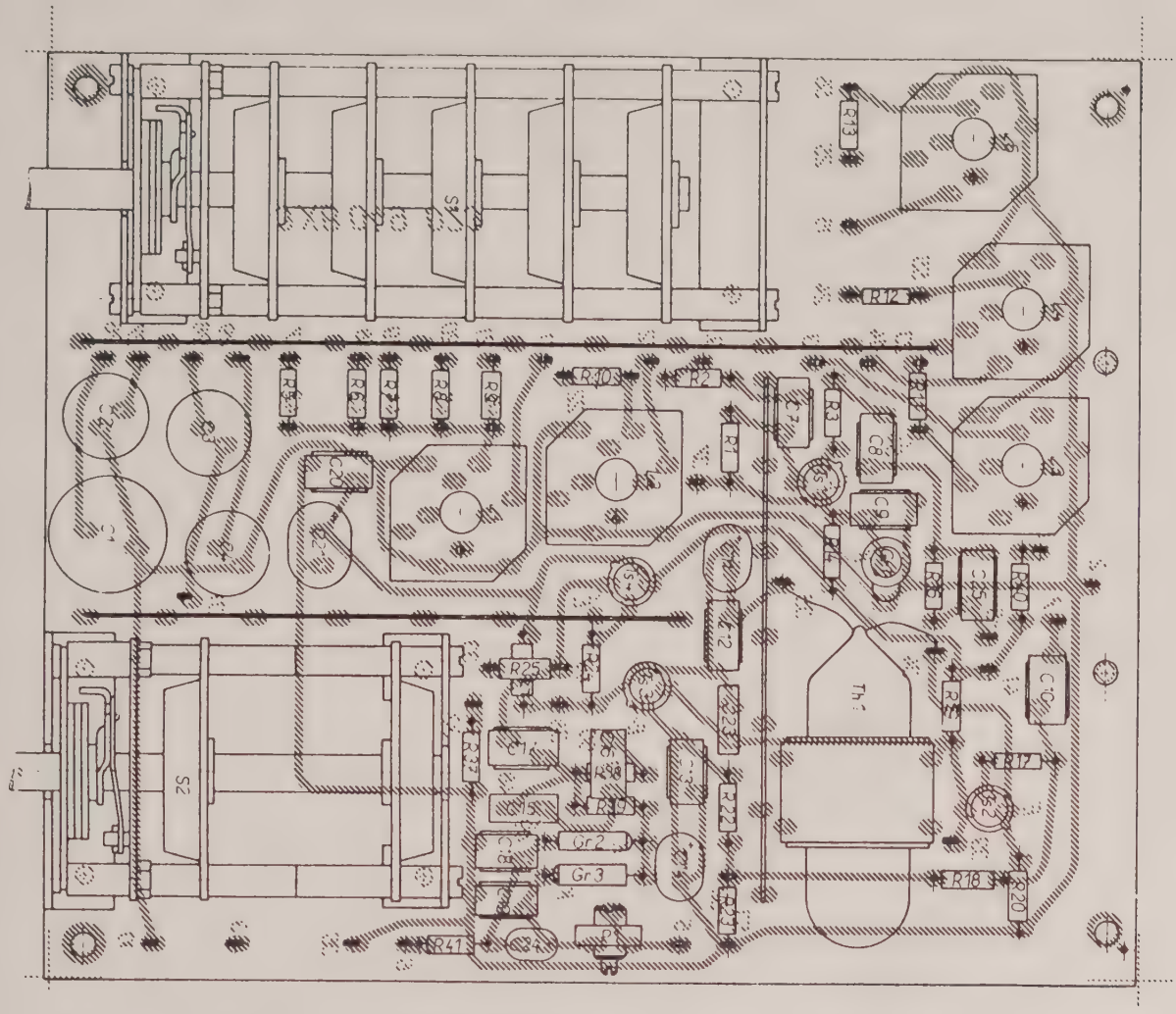


Bild 7 Oszillator-Baugruppe
FIG. 7 OSCILLATOR SUBASSEMBLA

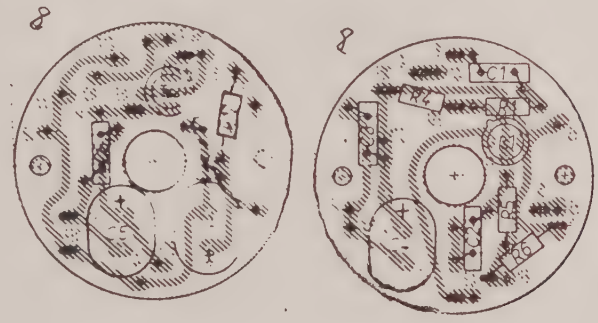


Bild 8 Pegelteiler-Baugruppe
FIG. 8 LEVEL DIVIDER SUBASSEMBLY

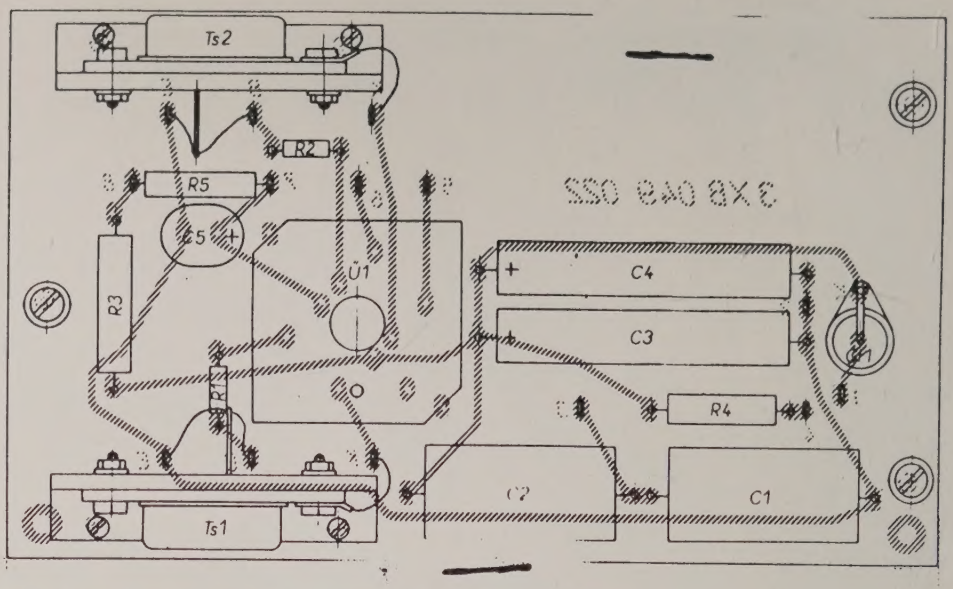


Bild 12 Spannungswandler-Baugruppe
FIG. 12 VOLTACE CHANGER SUBASSEMBLY

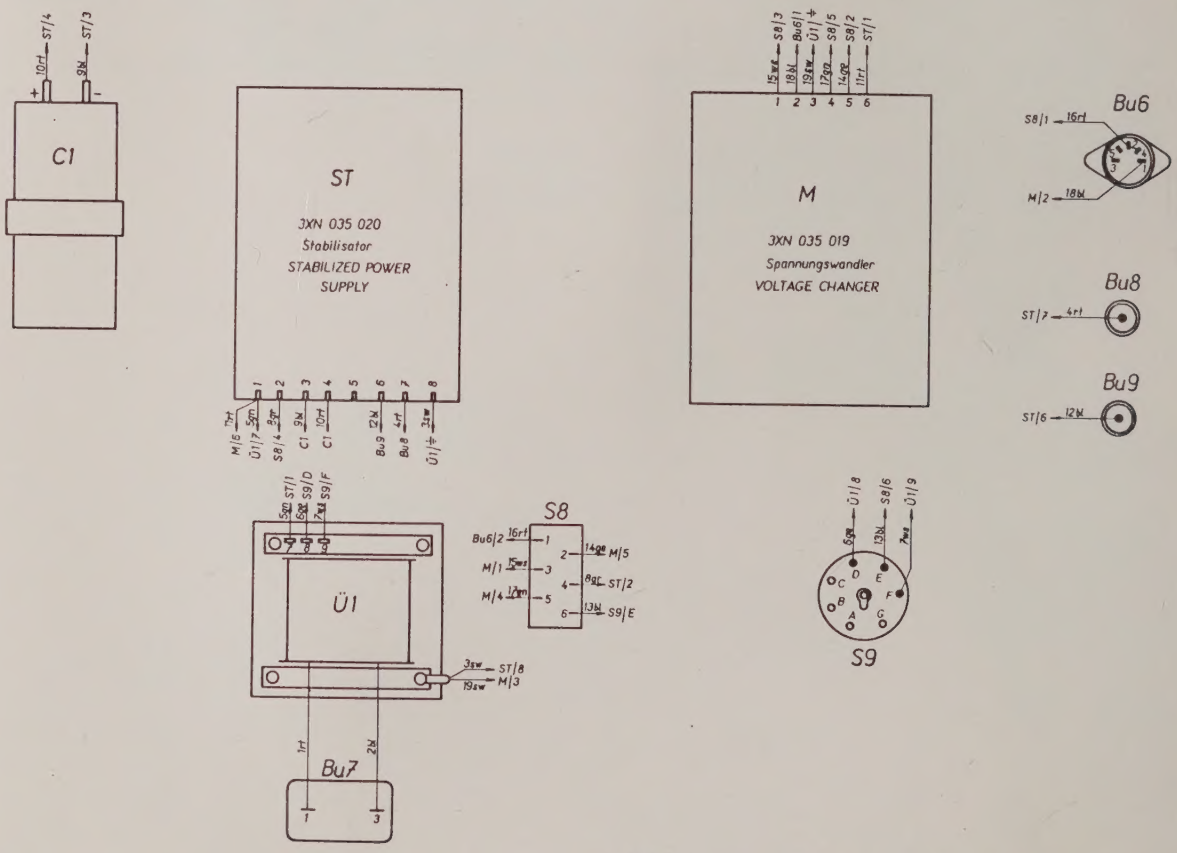


Bild 13 Speiseteil-Baugruppe
FIG. 13 POWER SUPPLY SUBASSEMBLY

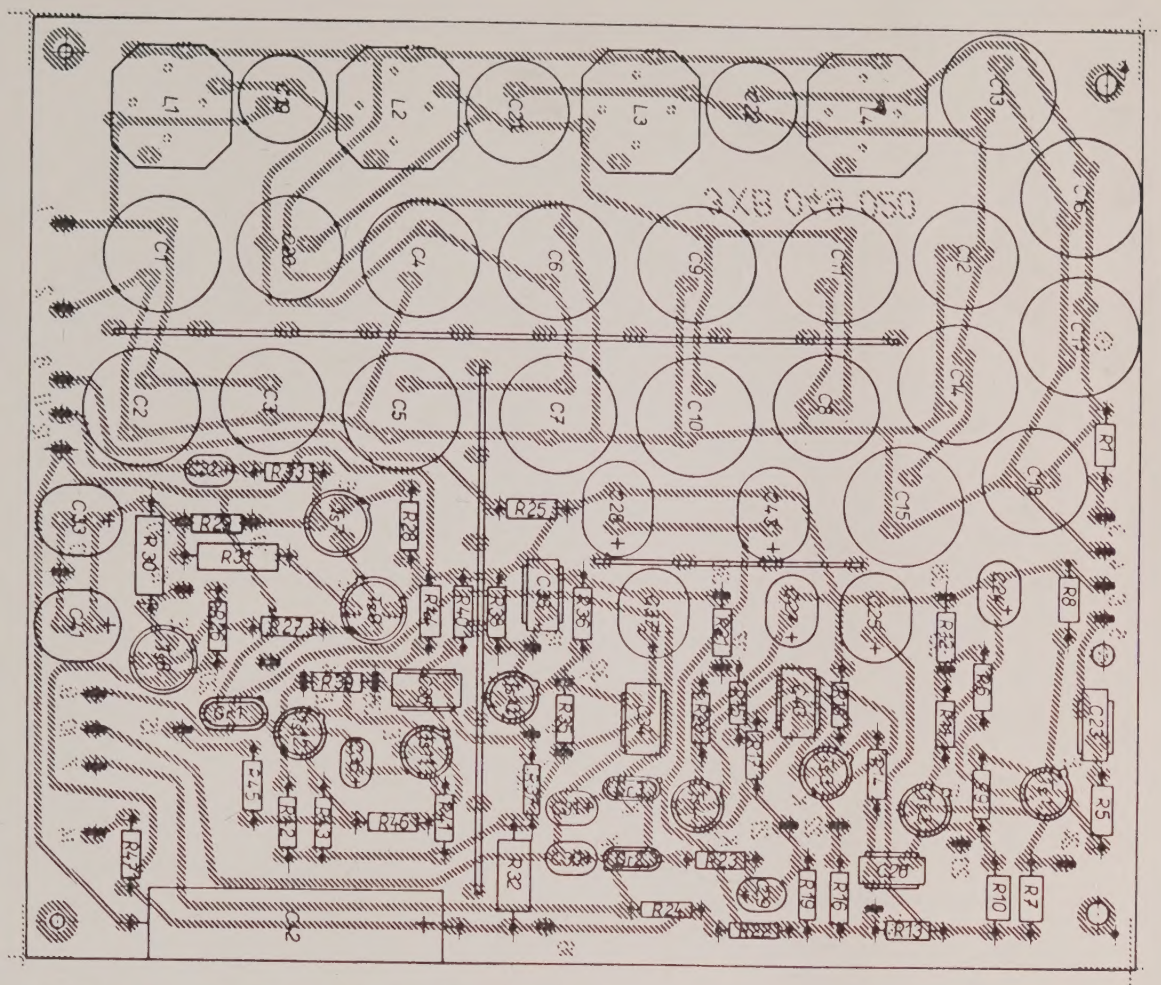


Bild 10 NF-Verstärker-Baugruppe

FIG. 10 AUDIO AMPLIFIER SUBASSEMBLY

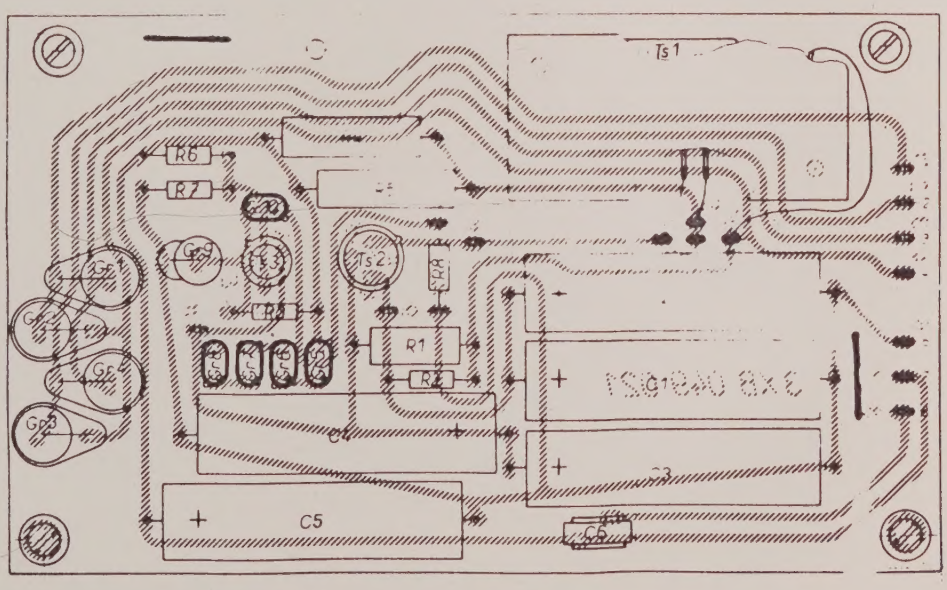
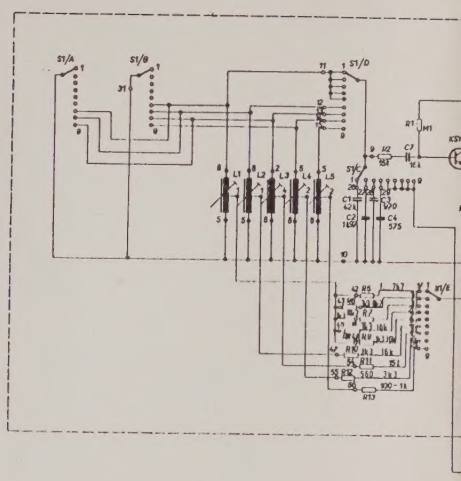
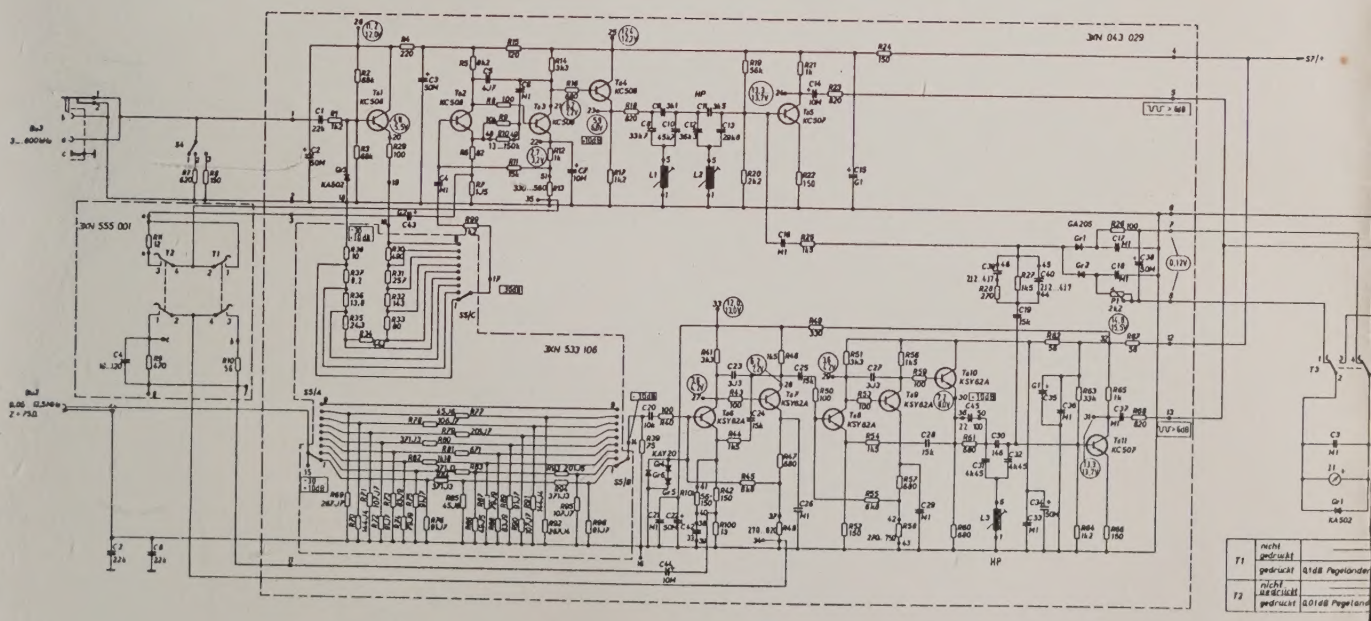


Bild 11 Stabilisator-Baugruppe

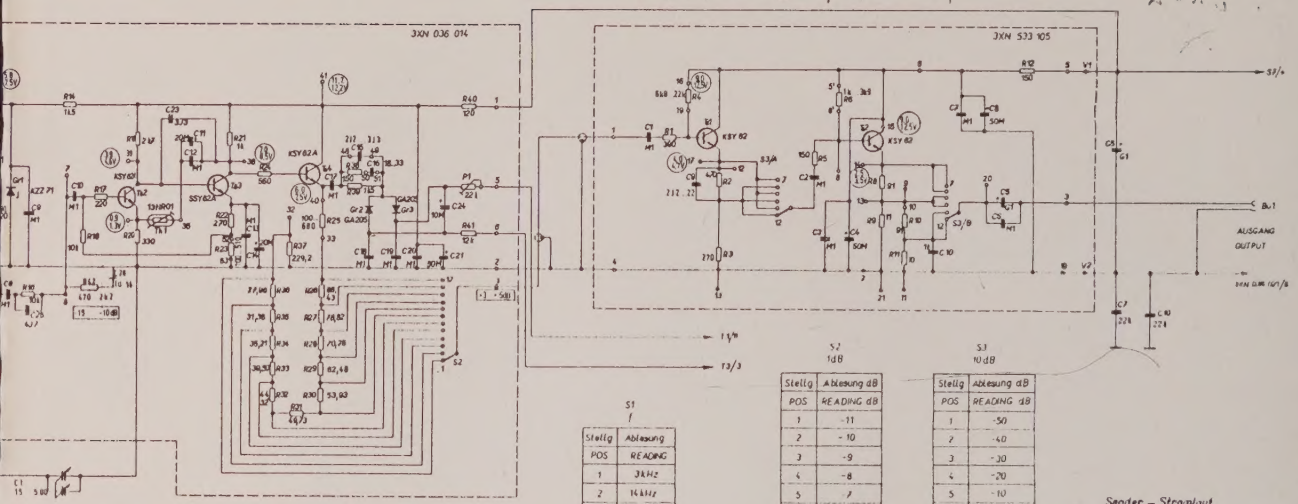
FIG. 11 STABILIZED POWER SUPPLY SUBASSEMBLY




3KN 043 029
3KN 555 001
3KN 533 106
S1/+
T1
T2
T3
nicht gedruckt
gedruckt
0,1dB Pegeländerung

with

19A115440-P1



S1

Stellg	Ablesung
POS	READING
1	3kHz
2	14 kHz
3	20kHz
4	26kHz
5	35...100kHz
6	0,1...0,3MHz
7	0,3...1MHz
8	1...3 MHz
9	3...10MHz

S2

Stellg	Ablesung dB
POS	READING dB
1	-11
2	-10
3	-9
4	-8
5	-7
6	-6
7	-5
8	-4
9	-3
10	-2
11	-1
12	0

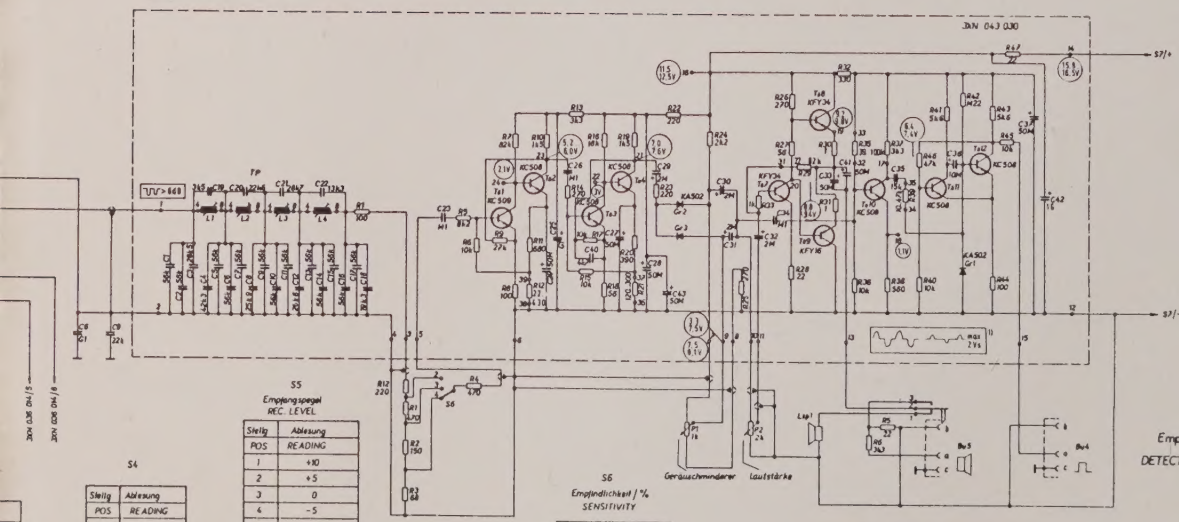
S3

Stellg	Ablesung dB
POS	READING dB
1	-50
2	-40
3	-30
4	-20
5	-10
6	0

Gleichspannungen der Arbeitspunkte kontrolliert man gegen die Masse.

Sender – Stromlauf
GENERATOR – PRINC. CIRCUIT DIAGRAM

Bildanlage 3
ANNEXED FIG. 3



S4

Stellg	Ablesung
POS	READING
1	∞10 k
2	600
3	150

S5

Stellg	Ablesung
POS	READING
1	+10
2	+5
3	0
4	-5
5	-10
6	-15
7	-20
8	-25
9	-30

S6

Stellg	Ablesung
POS	READING
1	10
2	30
3	100

1) in Abhängigkeit von der Lage der Potentiometer P1 u. P2 und des Schalters S8

Empfänger – Stromlauf
DETECTOR – PRINC. CIRCUIT DIAGRAM

Bildanlage 4
ANNEXED FIG. 4